Adolescent Māori Mental Health: Emerging Risk Factors

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He Mihi

"Ehara taku toa i te toa takitahi, engari he toa takitini"

E mihi atu te uri whakaheke nei nō te iwi o Ngāi Tahu me te hapū o Ngāti Wheke, nō Ngāti Kāhungunu me te hapū o Ngāti Kurukuru, nō ngā iwi Kōtirana o MacMillan me Macpherson.

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Abstract

In New Zealand, a number of studies have documented that New Zealand Māori are at increased risk for a range of adverse developmental outcomes compared to non-Māori. Social scientists have offered a range of explanations for these ethnic differences, but often lack the necessary data to adequately test these explanations. This study used data from a long-term longitudinal study of a birth-cohort of New Zealand adolescents (N = 983) to examine the associations between ethnicity (New Zealand Māori versus non-Māori), prevalence rates of psychiatric disorder (both internalizing and externalizing) and suicidal ideation at age 15, 16, and 18 years. The study also investigated if any differences in mental health outcomes between the two groups were explained by a range of life-course experiences, including childhood socio-economic disadvantage, childhood family adversity, and adolescent deviant peer affiliation. Parents reported on children's ethnicity at 14 years of age, and psychiatric disorder was measured in adolescence through both self-reports and parent reports. Generalised estimating equation (GEE) models were fitted to repeated measures data to gauge the strength of the associations between Māori ethnicity and psychiatric disorders during adolescence. These GEE models were then extended in a series of adjustments to control for childhood socio-economic disadvantage, childhood family adversity, and adolescent deviant peer affiliation. Findings indicated that the significant ethnic differences in rates of mental disorder amongst New Zealand adolescents were largely explained by the higher rates of exposure amongst Māori to socio-economic disadvantage during childhood, childhood family adversity, and deviant peer affiliation during adolescence. These findings contribute to our understanding of the effects of adverse life-course experiences on an individual's risk for poor adolescent mental health outcomes.

1. Introduction

The mental health of New Zealanders who identify as Māori has become an increasing concern over the past few decades, with one scholar claiming that 'poor mental health is the most serious health problem facing Māori' (Durie, 1997, p. 2). Prevalence rates of mental disorder amongst Māori are significantly higher than those of non-Māori, with Māori being over-represented in New Zealand's mental health indices (Te Puni Kokiri, 1996; Te Rōpū Rangahau Hauora a Eru Pōmare, 2007). Mental health trends amongst Māori adolescents show similar patterns, with available research indicating that Māori adolescents have higher rates than their non-Māori counterparts in many mental disorders including depression, anxiety, conduct disorder, suicidal ideation / suicide attempts, and alcohol and illicit substance abuse (Fergusson, Poulton, et al., 2003).

In addition to these higher rates of psychiatric disorder, research has also suggested that Māori are more likely to be socioeconomically disadvantaged in childhood (Marie, Fergusson, & Boden, 2014), and are more likely to have experienced childhood adversity than their non-Māori counterparts (Marie, Fergusson & Boden, 2009). As low socio-economic status (SES) in childhood and childhood adversity have both been shown to be associated with poor mental health outcomes (Kessler, McLaughlin, et al., 2010; McLaughlin et al., 2011), questions have arisen as to whether the observed ethnic differences in rates of mental disorder could partially be explained by the higher rates of exposure amongst Māori to these risk factors. Whilst deviant peer affiliation is also known to be associated with maladjustment and psychopathology in adolescence (Boden, Fergusson, & Horwood, 2010; Buehler, 2006; Fergusson, Wanner, Vitaro, Horwood, & Swain-Campbell, 2003), no research has yet explored whether there are ethnic differences in deviant peer affiliation and whether this too may be contributing to higher rates of mental disorder and maladjustment amongst Māori adolescents.

It is apparent that the ethnic differences in mental health and the nature of these differences need to be examined more closely, with consideration given to life-course experiences that include a range of developmental contexts and how these factors combine to influence mental health in the New Zealand adolescent population.

1.1 Māori Mental Health

Routinely collected hospitalisation data reveals that prior to 1970, Māori had lower rates of admission to psychiatric hospitals than non-Māori (Pomare & de Boer, 1988; Woodward, 2004). However, following the rapid migration of Māori away from their marae to urban centres throughout the 1950's and 1960's, Māori were increasingly isolated from their traditional homes, extended families and cultural practices (Durie, 2001; Harpham, 1994). It is theorised that this process of urbanisation and the policies of assimilation held by the New Zealand governments of the time may have contributed towards an increased vulnerability in Māori to mental disorders (Durie, 1998; Kingi, 2005), with Māori rates of psychiatric hospitalisation increasing throughout the 1980s and 1990s (Bridgeman & Dyall, 1996; Edmonds, Williams, & Walsh, 2000; Pomare, Keefe-Ormsby, & Ormsby, 1995; Te Puni Kōkiri, 1993), until Māori were comparatively overrepresented in inpatient populations. These patterns have continued, with analysis of more recent data revealing comparatively high rates of contact amongst Māori with both inpatient and community mental health sectors (Gaines, Bower, & Buckingham, 2003; New Zealand Health Information Service, 2004)

Research on the mental health of Māori within a community setting shows similar trends, with The Mental Health and General Practice Investigation showing that Māori (especially Māori women) present to primary care with higher rates of all common mental disorders in comparison to non-Māori (including anxiety, depression and substance abuse)(Bushnell & MaGPIe Research Group, 2005; MaGPIe Research Group, 2003a). These outcomes were consistent even when differences in socioeconomic status and age were accounted for (Bushnell & MaGPIe Research Group, 2005; MaGPIe Research Group, 2003b).

This disproportionately high representation of Māori with mental disorders is also evident in the Te Rau Hinengaro: The New Zealand Mental Health Survey, which used the Composite International Diagnostic Interview (CIDI 3.0) to gather data between October 2003-December 2004. Te Rau Hinengaro found the lifetime prevalence of mental disorder (based on DSM-IV diagnostic criteria) amongst Māori to be as high as 50.7%, with a 12 month prevalence of 29.5% and a 1 month prevalence of 18.3% (Baxter, Kingi, Tapsell, Durie, & McGee, 2006). These 12-month prevalence rates were substantially higher than those of other New Zealanders, as can be seen in Table 1. Once age, sex, educational qualifications and equivalised household income had been adjusted for, differences remained significant for Māori compared to other ethnicities for any mental disorder (23.9% *vs* 20.3%%, $p<0.003$) and any serious mental disorder (6.1% *vs* 4.5%, $p<0.003$) (Baxter, Kokaua, et al., 2006).

Table 1:

Te Rau Hinengaro: Prioritised Ethnicity and 12 Month Prevalence of any Disorder and Serious Disorder During 2003-2004†

	Māori % (95% CI)	**Pacific % (95% CI)**	**Other % (95% CI)**
Any 12 Month Disorder			
Unadjusted	29.5 (26.6, 32.4)	24.4 (21.2, 27.6))	19.3 (18.0, 20.6)
Adjusted for Age and Sex	26.4 (23.7, 29.0)	21.8 (18.8, 24.7	19.8 (18.4, 21.1)
Adjusted for Age, Sex, Educational Qualifications and Equivalised Household Income	23.9 (21.3, 26.4)	19.2 (16.4, 22.1)	20.3 (18.9, 21.6)

†DSM-IV CIDI 3.0 disorders with hierarchy. CI, confidence interval.

Table 2:

Te Rau Hinengaro: *Hazard Ratios for Estimated Projected Lifetime Risk for Disorder Groups, by Age Group (Birth Cohort), Sex and Ethnicity (Unadjusted and Adjusted for the Influence of Age group, Sex and Socioeconomic Correlates) During 2003-2004*

	Hazard Ratio for Lifetime Disorders (%)† (95% CI)				
	Any Anxiety Disorder	**Any Mood Disorder**	**Any Substance Abuse Disorder**	**Any Eating Disorder**	**Any Disorder**
Ethnicity (Unadjusted)					
Māori	1.5 (1.3, 1.7)	1.5 (1.4, 1.7)	3.1 (2.7, 3.5)	2.4 (1.6, 3.5)	1.7 (1.5, 1.9)
Pacific	1.1 (1.0, 1.3)	1.1 (1.0, 1.3)	1.8 (1.6, 2.2)	3.5 (2.3, 5.5)	1.4 (1.3, 1.6)
Other	1.0	1.0	1.0	1.0	1.0
Ethnicity (Adjusted for Age Group and Sex)					
Māori	1.3 (1.2, 1.5)	1.2 (1.1, 1.4)	2.6 (2.3, 3.0)	1.8 (1.2, 2.6)	1.4 (1.3, 1.6)
Pacific	1.1 (1.0, 1.3)	0.9 (0.8, 1.0)	1.5 (1.3, 1.8)	2.7 (1.7, 4.2)	1.2 (1.1, 1.4)
Other	1.0	1.0	1.0	1.0	1.0
Ethnicity (Adjusted for Age Group, Sex, Educational Qualification and Equivalised Household Income)					
Māori	1.2 (1.0. 1.3)	1.1 (1.0, 1.3)	2.0 (1.8, 2.4)	1.6 (1.1, 2.4)	1.3 (1.1, 1.4)
Pacific	1.0 (0.8, 1.1)	0.8 (0.7, 1.0)	1.5 (1.3, 1.8)	2.5 (1.6, 3.9)	1.0 (0.9, 1.2)
Other	1.0	1.0	1.0	1.0	1.0

†DSM-IV CIDI 3.0 disorder groups. CI, confidence interval.

When the Te Rau Hinengaro results are analysed using lifetime adjusted risk ratios, as seen in Table 3, the hazard ratios for life-time disorder indicate that Māori experience an additional burden of lifetime mental disorder in comparison to other ethnic groups, even once socioeconomic position and differing population structures have been adjusted for (Baxter, Kokaua, et al., 2006). However, some studies have shown divergence from this trend, with the data of the most recent New Zealand Health Survey (2012/2013) showing that the percentage of Māori adults who have been diagnosed with a common mental disorder decreased slightly from 15.8% in 2011/12 to 15.7% in 2012/13, as seen in Table 4 (Ministry of Health, 2012). Moreover, in contrast to the previously discussed trend of comparatively higher rates of disorder amongst Māori, the prevalence of mental disorder was found to be the same in both Māori and non-Māori populations (Ministry of Health, 2012).

Table 3:

Unadjusted Prevalence and Adjusted Rate Ratios of Diagnosed Common Mental Disorder in the Adult Population Aged 15 Years and Over (Depression, Bipolar Disorder, Anxiety Disorder), New Zealand Health Survey 2011/12 and 2012/13

	Total % (95% CI)	**Adjusted Rate Ratio (95% CI)**
2011/12		
Māori	15.8 (14.0–17.8)	0.99 (0.87–1.13)
Pacific	7.0 (5.0–9.5)	0.44 (0.32-0.59)*
Asian	4.4 (2.8–6.4)	0.24 (0.17 – 0.36*
European/Other	18.6 (17.5–19.6)	
2012/13		
Māori	15.7 (13.9–17.7)	0.98 (0.85–1.12)
Pacific	4.3 (2.8–6.3)	0.25 (0.17–0.37)*
Asian	5.6 (4.2–7.2)	0.32 (0.24–0.41)*
European/Other	19.1 (18.1–20.2)	

A rate ratio less than 1 means the outcome is less likely in the group of interest than in the reference group. A rate ratio greater than 1 means the outcome is more likely in the group of interest. Rate ratios adjust for factors such as age, sex and ethnic group. Statistically significant rate ratios are noted with an asterisk (*).

Table 4:

Unadjusted Prevalence and Adjusted Rate Ratios of Psychological Distress (High or Very High Probability of Anxiety Or Depressive Disorder on K10 Scale) in the Adult Population Aged 15 Years and Over, New Zealand Health Survey 2011/12 and 2012/13		
	Total % (95% CI)	**Adjusted Rate Ratio (95% CI)**
2011/12		
Māori	9.1 (7.7–10.6)	1.71 (1.40–2.08)*
Pacific	10.1 (7.1–13.7)	1.79 (1.36–2.36)*
Asian	6.5 (4.4–9.1)	1.12 (0.80-1.56)
European/Other	4.9 (4.4–5.5)	
2012/13		
Māori	9.6 (7.9–11.6)	1.66 (1.33–2.06)*
Pacific	8.9 (6.5–11.8)	1.43 (1.03–1.99)*
Asian	4.9 (3.3–7.0)	0.74 (0.49–1.10)
European/Other	5.9 (5.2–6.6)	
A rate ratio less than 1 means the outcome is less likely in the group of interest than in the reference group. A rate ratio greater than 1 means the outcome is more likely in the group of interest. Rate ratios adjust for factors such as age, sex and ethnic group. Statistically significant rate ratios are noted with an asterisk (*).		

This anomaly could be due to the definition of 'common mental disorders' used in the New Zealand Health Survey, which included only the internalising disorders of major depression, anxiety disorder and bipolar disorders. This definition excludes all externalising disorders, substance abuse disorders and suicidality, which may have impacted on the findings. The findings of reducing rates of disorder amongst Māori and similar rates of disorder amongst Māori and non-Māori may also be a consequence of the survey's reliance on the individual's self-report of 'diagnosis by a doctor' (Ministry of Health, 2012). This reliance on the individual's self-report of diagnosis by a doctor may be problematic when trying to accurately gauge the prevalence of mental disorders amongst Māori, as Māori experience disparities in accessing and engaging with health care providers (Reid & Robson, 2006). These disparities could lead to proportionally fewer Māori being officially diagnosed with a mental disorder by a doctor than non-Māori, which may have resulted in the New Zealand Health Survey findings reflecting this poor access to health services, rather than any actual reduction in mental disorder or similar prevalence of mental disorders amongst Māori and non-Māori. Further findings from The New Zealand Health Survey (displayed in Table 4) support this notion as, despite the similar rates of common mental disorders amongst Māori and non-Māori (16%) (Ministry of Health, 2012), Māori were 1.7 times more likely to

experience psychological distress than non-Māori (as measured by the Kessler Psychological Distress Scale (K10) (Kessler et al., 2002). This finding is supportive of the suggestion that Māori with mental disorders may be less likely to seek help for and/or may face more barriers to accessing mental health services (Ministry of Health, 2012).

1.2 Adolescent Mental Health

Identification and treatment of mental disorders in adolescence is needed in order to minimise the negative impacts of mental disorders later in life (Copeland, Shanahan, Costello, & Angold, 2009; Newman et al., 1996). The body of literature regarding the prevalence of mental disorders in New Zealand adolescents is growing, with available research indicating a substantial proportion of New Zealand adolescents experiencing mental health problems. Studies indicate that the 12 month prevalence rates of disorder amongst adolescents (using DSM-III and DSM_III_R criteria) range from 18.2% to 25.9% at age 15 (Fergusson & Horwood, 2001; McGee et al., 1990), increasing to 36.6% to 42% at age 18 (Feehan, McGee, Raja, & Williams, 1994; Fergusson & Horwood, 2001). More recent school based surveys (2012) investigated aspects of the mental and emotional health of adolescents attending secondary schools in New Zealand. The results indicate that 9% to 16% of students reported clinically significant depression symptoms (based on the Reynolds Adolescent Depression Scale – Short Form (RADS-SF) (Clark et al., 2013; Milfont et al., 2008; Reynolds & Mazza, 1998). Suicidality was also investigated, with 10% to 21% of students having seriously thought about suicide in the previous 12 months and 2% to 6% of students having attempted suicide during the last year (Clark et al., 2013). Furthermore, questions around substance abuse behaviours revealed that 23% of students reported binge drinking in the last four weeks, and 13% were currently using marijuana (Clark et al., 2013).

These rates of mental disorder in New Zealand adolescents appear to be relatively high in comparison to other countries. A review by Roberts, Attkisson, and Rosenblatt (1998) of 52 studies of prevalence estimates of psychiatric disorder in youth and adolescents throughout 20 different countries indicated that the median prevalence of psychiatric disorder amongst adolescents was 15%. These differences in prevalence rates may reflect a difference in the timeframe used for measurement, with the most common time frame for calculating prevalence rates of disorder in the review by Roberts et al. (1998) being the present time, where as Feehan et al. (1994) and Fergusson and Horwood (2001) examined prevalence of mental disorder over the preceding year, which is likely to yield higher prevalence rates due

to the longer time period under examination. In addition to this, the use of DSM criteria for psychiatric disorders as used by Feehan et al. (1994) and Fergusson and Horwood (2001) generally appears to yield higher prevalence rates than the Rutter interview schedules, questionnaires, or classification procedures (Roberts et al., 1998; Rutter, Tizard, & Whitmore, 1970), which were used in a majority of the studies reviewed by Roberts et al. (1998).

1.3 Mental Health of Māori Adolescents

The body of research examining the mental health of Māori adolescents is also expanding, with available research indicating that there is a similar pattern of Māori overrepresentation in New Zealand's adolescent mental health indices as observed the adult Māori population. Trends in inpatient statistics are similar to those in adult populations, with van Kessel, Myers, Stanley, and Reed (2012) finding that over a 10-year period admissions to a regional child and adolescent psychiatric inpatient unit by those of Māori descent increased. They also found that there was an over-representation of young Māori being admitted to the unit relative to the catchment population.

Patterns of adolescent Māori mental health in a community setting also indicate that Māori youth have a higher prevalence of mental disorder symptoms than their Pākehā / NZ European counterparts. The Youth'07 Survey of Health and Wellbeing of New Zealand Secondary School Students found that Māori females (16.4%) were significantly more likely to report depressive symptoms than Pākehā/NZ European females (12.7%), and that Māori were more likely to report engaging in binge drinking (50.9% vs 35.6% respectively), and weekly marijuana use (10.2% vs 3.7%)(Clark et al., 2008). Māori students were also more likely to have made a suicide attempt, (4.4% - 9.6%) compared to Pākehā/NZ European students (2.4% - 5.1%) (Clark et al., 2008). This increased prevalence of suicidality in Māori youth is supported by Beautrais and Fergusson (2006), who found Māori youth aged 15 to 24 were 2-3 times more likely to die by suicide than non-Māori youth.

Large longtitudinal cohort studies have also found that Māori adolescents have a higher prevalence of mental disorder than non-Māori, with both the Christchurch Health and Develpment Study (CHDS, Table 5) and the Dunedin Multidisciplinary Health and Development Study (DMHDS, Table 6) finding that Māori generally appear to have higher odds of mental disorders during adolescence (Fergusson, Poulton, et al., 2003). Specifically, at ages 14-15, Māori adolescents had higher odds of mental disorder than non-Māori for a majority of the disorders studied (findings shown in Tables 5 and 6), including anxiety,

conduct disorder, substance abuse or dependence, and any mental disorder. The exceptions were depression and suicide attempt at age 14-15 for which there was no significant ethnic differences in prevalence rates. Findings from the CHDS also found that Māori had higher odds of depression, conduct disorder, substance abuse and any mental disorder at ages 17-18, while the DMHDS found that Māori aged 17-18 had higher odds of depression, suicidal ideation and any mental disorder (Fergusson, Poulton, et al., 2003). The differences in results between the DMHDS and the CHDS is suprising given that the methodology used is similar. However, the differences in findings may reflect the differences in Māori sample sizes, with the DMHDS relying on a Māori sample that was roughly 40% smaller than the CHDS sample. Despite some differences in results, the research reviewed above collectively indicates that Māori youth are at a higher risk of experiencing mental health problems than non-Māori New Zealand adolescents, pointing to a need for further research into the mechanisms and factors influencing these higher prevalence rates.

Table 5:

12 Month Prevalence of Psychiatric Disorders by Ethnicity in the CHDS at Ages 15 and 18 Years

	Māori %	Non-Māori %	Odds Ratio	P
15 years				
Depression (14-15 years)	8.1	6.0	1.4	>.40
Anxiety Disorder (14-15 years)	20.2	12.4	1.8	<.05
Conduct Disorder (14-15 years)	14.1	3.5	4.5	<.0001
Substance Abuse/Dependance (14-15 years)	12.1	4.6	2.8	<.01
Any Disorder (14-15 years)	34.3	20.8	2.0	<.01
Suicide Attempt (14-15 years)	2.0	1.8	1.1	>.80
N	99	821		
18 years				
Depression (17-18 Years)	26.4	17.5	1.7	<.05
Anxiety Disorder (17-18 Years)	23.6	16.5	1.6	>.05
Conduct Disorder (17-18 Years)	11.8	3.8	3.4	<.001
Substance Abuse/Dependance (17-18 Years)	31.8	22.5	1.6	<.05
Any Disorder (17-18 Years)	54.6	40.3	1.8	<.01
Suicide Attempt (17-18 Years)	6.4	3.0	1.6	>.20
N	110	873		

Table 6:

Prevalence of Psychiatric Disorders by Ethnicity in the DMHDS at Age 18 Years				
	Māori %	Non-Māori %	Odds Ratio	P
18 years				
Depression (17-18 Years)	27.3	16.9	1.8	<.05
Anxiety Disorder (17-18 Years)	30.3	21.3	1.6	>.05
Conduct Disorder (17-18 Years)	13.6	7.7	1.9	>.05
Substance Abuse/Dependance (17-18 Years)	26.9	20.1	1.5	>.10
Any Disorder (17-18 Years)	57.6	43.5	1.8	<.05
Suicide Ideation (17-18 Years)	21.2	9.9	2.5	<.01
N	66	844		

1.4 Life-course Developmental Theory

Developmental life course theory emerged in the 1960s. and integrates knowledge and theory from several disciplines including sociology, anthropology, social history, demography and psychology. The life course refers most broadly to a theoretical orientation that encourages the study of changing lives in changing contexts, and stems from a sociological view of human development, integrating role theory, and theories of aging (Noguchi & Yoshioka, 2009). Building on advances since the 1960's, life-course theory has developed to examine the human life course by observing developmental processes and how these interact with ongoing changes in society. The premise behind this is that age situates people in particular birth cohorts and social structures. Particular events that occur or social policies in place during the lives of a given cohort can intersect with their development to influence their life course (examples of such events or policies might include the abolition of slavery, women gaining the right to vote, or intra- and inter-country conflict and war).

Life course theory is defined by four key principles: (1) The principle of historical time and place – our lives are embedded in and shaped by historical context. (2) The principle of human agency – individuals help shape their development through their own choices and actions, yet within the constraints of historical and social circumstance. (3) The principle of linked lives – our lives are intertwined through social relationships. (4) The principle of timing – the meaning and impact of a life transition is contingent on when it occurs (Elder, 1998). In addition to these principles, life course theory operates on the premise that human development and ageing are a lifelong processes and are more fully understood from a lifespan perspective. This suggests that any change in an individual's life course has consequences for their developmental trajectory. The childhood years of development therefore have formative implications for subsequent trajectories and healthy adaptations in later life (Elder, 1998).

Life course development theory is a useful framework by which to analyse the etiology of health outcomes, and has been adopted by epidemiologists wishing to identify risks for these health outcomes at the beginning of the etiologic process (Lynch & George Davey, 2005). The ability to identify life-course experiences operating as risk factors early in the lifespan provides the opportunity for early intervention, which may have the potential to minimise or even prevent negative outcomes (Hertzman & Power, 2003). Life course epidemiology suggests specific ways in which risk factors are related (and interrelated) to health outcomes over the life course. These consist of three general models: (1) Latency – in which an

exposure early in the life course, particularly during a sensitive period, is associated with a certain health outcome after a period of time. (2) Accumulation – in which exposure to disadvantageous experiences and environments accumulate, increasing the risk of a certain health outcome. (3) Pathways or "chains of risk" – in which exposures in the early life course are associated with later health outcomes through a "chain" or series of intervening risks (Kuh et al., 2003). These models of the life course are not necessarily mutually exclusive and any health outcome may have a number of models applied (Power & Hertzman, 1997). A life course development perspective has also been applied to mental health outcomes and psychopathology (Bell, 2014; Shanahan, 2010), with efforts being made to identify early risk factors or pathways that may contribute to the development of poor mental health or psychiatric disorder throughout the life course. Longitudinal birth cohort studies are generally well suited to these types of investigations as data is collected at regular intervals from birth onwards throughout the life course, enabling researchers to identify early risk factors, pathways, and trajectories that lead to the outcome of interest (Costello & Angold, 2007).

As discussed previously, New Zealand Māori appear to have higher prevalence rates of psychiatric disorder than their non-Māori counter parts, with this trend extending to adolescent populations. When considered from a developmental life course perspective, these ethnic differences in rates of mental disorder could be linked to ethnic differences in exposure to early risk factors for psychopathology, with Māori potentially having higher rates of exposure to early risk factors for psychopathology than non-Māori. The potential for ethnic differences in exposure to early risk factors for psychopathology warrants further investigation, as findings may have important implications for public health, especially regarding reduction in ethnic inequalities in mental health and the value of early intervention.

1.5 Risk Factors Associated with Poor Mental Health

A risk factor is any characteristic at the biological, family, or community (including peers and culture) level that is associated with an increased likelihood that an individual will develop a negative outcome such as disease or psychological disorder (Cicchetti, 1989; Cicchetti & Cohen, 2006). In the context of this study risk factors refer to factors that increase an individual's risk of developing suicidal ideation or psychiatric disorder.

The presence of one or more risk factors in a child's life has the potential to increase the likelihood that a negative outcome will occur at a later point in time (Cicchetti, 1989; Cicchetti & Cohen, 2006). However, the presence of a risk factor does not guarantee or

ensure that a specific outcome, such as psychopathology, will inevitably occur. Rather, the presence of a risk factor suggests an increased probability or chance that the negative outcome might develop (Cicchetti, 1989; Cicchetti & Cohen, 2006).

The following paragraphs will identify risk factors known to be associated with poor mental health and psychiatric disorder, and will review literature regarding the associations between exposure to these factors during childhood and mental health outcomes during adolescence. Ethnic differences in exposure to these adverse factors will also be examined.

1.5.1 Low Socio-Economic Status

Socio-economic status (SES) generally refers to an individual's or family's economic and social position in relation to others and may be derived from a number of measures including income, education level and occupation (Kahl & Davis, 1955). SES is generally broken up into three categories (high SES, middle SES and low SES) to describe the level of socio-economic status an individual or family has. High SES is associated with high income, high educational qualifications, and highly trained or qualified occupations that generally have a higher degree of autonomy or responsibility, while low SES is associated with low income, a lack of educational qualifications and occupations that are less well paid, do not require much training or qualifications and generally have a lower level of autonomy (Ganzeboom, De Graaf, & Treiman, 1992).

Research has indicated that low SES is associated with a number of adverse health outcomes, including that of poor mental health (Graham, 2007; Gu, Xu, Yang, & Li, 2010). Research has shown low SES to be associated with increased rates of a number of mental health problems including both internalising disorders and externalising disorders (Compton, Conway, Stinson, Colliver, & Grant, 2005; Lorant et al., 2003; Miech, Caspi, Moffitt, Wright, & Silva, 1999; Redonnet, Chollet, Fombonne, Bowes, & Melchior, 2012; Regier, Narrow, & Rae, 1990; Thomas, Stinson, Grant, & Compton, 2007; Van Oers, Bongers, Van de Goor, & Garretsen, 1999). These associations between socio-economic disadvantage and psychiatric disorder are supported by findings from a seven year longitudinal study performed by Hudson (2005) who analysed the hospital records and census data of 34,112 patients with two or more hospitalisations for psychiatric disorder over the study period. Hudson's 2005 findings revealed remarkably strong and consistent negative correlations between socio- economic conditions and mental illness, indicating that the poorer one's socio-economic conditions are, the higher one's risk is for psychiatric disorder and psychiatric hospitalisation. A more recent study by Foulds, Wells, and Mulder (2014) has

provided evidence for links between adverse socio-economic conditions and psychological distress in a New Zealand context. Foulds et al. (2014) examined the relationship between living standard and psychological distress using a community sample of 8,465 New Zealand adults and found that higher levels of psychological distress were more prevalent in those with a lower standard of living, with the prevalence of high psychological distress increasing steeply with decreasing living standards. Specifically, 24.3% of those in the most deprived decile experienced high psychological distress, compared to only 0.8% in the least deprived decile (Foulds et al., 2014).

Poor socio-economic status has also been shown to be a risk factor for externalising problems, with socio-economic disadvantage predicting later externalising problems, including antisocial behaviour, violent behaviour and criminal offending (Farrington, 2003). This was shown in the Cambridge Study in Delinquent Development, a prospective longitudinal survey of the development of offending and antisocial behaviour in 411 South London boys, mostly born in 1953 and followed up by personal interviews from age 8 to age 46 (Farrington, 2003). Findings indicated that low family income, large family size and low socio-economic status were important childhood predictors of later violent behaviour, chronic offending, and antisocial personality at ages 21 and 32 (Farrington, 2000; Farrington & West, 1993).

1.5.2 Low Socio-Economic Status During Childhood and Adolescence

The association between socio-economic adversity and poor mental health outcomes has also been found in child and adolescent populations (Drakopoulos, Lakioti, & Theodossiou, 2011; McLaughlin et al., 2011). Children from low SES families are more likely to exhibit anti-social behaviour (Evans & Cassells, 2014; Piotrowska, Stride, Croft, & Rowe, 2015), with both oppositional defiant disorder and conduct disorder being more prevalent amongst youths from families of low SES (Lahey, Waldman, & McBurnett, 1999). Low family SES has also been associated with a higher risk of anxiety disorders, disruptive disorders, and personality disorders in youth (Gilman, Kawachi, Fitzmaurice, & Buka, 2002; Johnson, Cohen, Dohrenwend, Link, & Brook, 1999; McLaughlin et al., 2011; Najman et al., 2010; Nikulina, Widom, & Czaja, 2011). A number of studies have also suggested that family SES is associated with depression amongst children and adolescents (Goodman, Huang, Wade, & Kahn, 2003; Johnson et al., 1999; Kubik, Lytle, Birnbaum, Murray, & Perry, 2003; Schraedley, Pamela, Gotlib, & Hayward, 1999). The research regarding SES and adolescent alcohol and substance use is inconclusive, with studies producing conflicting results. While

some studies have found associations between low SES and adolescent alcohol and substance use (Droomers, Schrijvers, Casswell, & Mackenbach, 2003; Lowry, Kann, Collins, & Kolbe, 1996; Stoolmiller et al., 1997), others studies have found that high SES adolescents have higher rates of substance and alcohol use (Hanson & Chen, 2007b; Humensky, 2010). Others still have found no significant relationship between SES and alcohol and substance use (Hanson & Chen, 2007a; Tuinstra, Groothoff, van den Heuvel, & Post, 1998).

Two large reviews of relevant literature have further supported these associations between early socio-economic disadvantage and poor mental health outcomes in children and adolescents. A review by Reiss (2013) found that, of the 55 published studies reviewed, 52 suggest an inverse relationship between socioeconomic status and poor mental health outcomes in children and adolescents, with children and adolescents from low SES families being two to three times more likely to develop mental health problems than those from high SES families. In addition to this, Reiss (2013) found that that persistent low SES over time was strongly related to higher rates of mental health problems, and that a decrease in SES was linked to increasing mental health problems. A meta-analysis conducted by Letourneau, Duffett-Leger, Levac, Watson, and Young-Morris (2013) also found links between low SES and children and adolescents' internalising and externalising problems. However, while the results of the Letourneau et al. (2013) meta-analysis did meet significance ($p<.01$ for aggression, $p<.05$ for internalising behaviours), the findings were of a very small magnitude. This is surprising given the research linking low SES to adverse child and adolescent developmental outcomes (Bornstein & Bradley, 2003; Keating & Hertzman, 1999). It is possible that the magnitude of the Letourneau et al. (2013) findings may have been affected by the comparatively small number of studies that met the inclusion criteria for their meta-analyses (only 7 articles were included in the externalising meta-analysis and 5 were included in the internalising meta-analysis), with the authors themselves noting that their strict selection criteria resulted in the exclusion of a large number of articles and has limited the ability to generalise their findings over time.

The above research reveals that low SES is a risk factor for poor mental health during all life stages, with socioeconomic disadvantage being associated with a number of psychiatric disorders in childhood, adolescence and adulthood. Studies have also revealed that socioeconomic disadvantage in childhood is associated with poor mental health outcomes during later life, including the onset and development of a range of psychiatric disorders during adolescence (Bradley & Corwyn, 2002; Felner et al., 1995; Von Rueden, Gosch, Rajmil, Bisegger, & Ravens-Sieberer, 2006). This association seen between childhood

poverty and later mental health outcomes has been proposed to impact upon an individual's life course in a number of different ways. It has been suggested that stressful socioeconomic environments can produce parental stress and behaviour that impacts upon children's developmental outcomes (McLoyd & Wilson, 1990; McMahon & Peters, 2002), while others argue that lower SES affects child development through the inability of parents to provide the tangible material resources needed to support healthy development (Bradley & Corwyn, 2002). Still others believe it is a combination of these factors, suggesting that parents in stressful economic situations find it difficult to provide the tangible or intangible resources required for children's successful development (Elder, Conger, Foster, & Ardelt, 1992; Lempers, Clark-Lempers, & Simons, 1989; Letourneau et al., 2013). Exclusion and social isolation, which contribute to the prevalence of externalising and internalising behaviours (Gazelle & Ladd, 2003; Heberle, Krill, Briggs-Gowan, & Carter, 2014; Rubin & Mills, 1988), have also been linked with low SES (Stewart et al., 2009), and research suggests that such "relational poverty," (i.e., a relatively small social support network), can have an adverse impact on children's behaviour and development (Kalff et al., 2001; Perry & Szalavitz, 2007; Perry & Szalavitz, 2010). It has also been proposed that low SES may impact on child development through its links with parental poor mental health (Petterson & Albers, 2001), which is associated with poor caregiver–child attachment and uninvolved, inconsistent and unsupportive parenting styles (Crittenden, 2008; Meadows, McLanahan, & Brooks‐Gunn, 2007).Whilst these various pathways all refer to different mechanisms by which adverse socio-economic conditions may affect child development and the development of mental disorders; regardless of the exact mechanism at play, the general consensus is that exposure to adverse socio-economic conditions during childhood can influence the developmental life course of children in a negative way, increasing risks of poor mental health during and throughout life.

1.5.3 Childhood Adversity

Childhood adversity refers to stressful or traumatic experiences that occur during childhood, and is also referred to in research as adverse childhood experiences (ACEs) (Babiss, 2012; Kalmakis & Chandler, 2014). Childhood adversity has been operationally defined in a number of different ways by researchers. This includes types of maltreatment such as neglect, emotional abuse, physical abuse and sexual abuse (Fergusson, Horwood, & Lynskey, 1994; Pietrek, Elbert, Weierstall, Müller, & Rockstroh, 2013). Previous research has also recognised types of parental maladjustment and maladaptive behaviours as childhood adversities, including parental criminal activity, parental alcohol abuse, parental substance

abuse, and parental psychopathology (Benjet, Borges, Méndez, Fleiz, & Medina-Mora, 2011; Fergusson et al., 1994; Schilling, Aseltine, & Gore, 2008). Factors that contribute to family instability or dysfunction have also been considered by researchers to be forms of childhood adversity, including family conflict or violence, divorce, number of changes in parental figure, and parental or interpersonal loss (Fergusson & Horwood, 2003; McLaughlin et al., 2012; Rosenman & Rodgers, 2004).

There are numerous studies that support the association between childhood adversity and poor mental health outcomes, with a range of evidence available regarding associations between various childhood adversities and later maladjustment and psychopathology. Childhood adversities that have been linked to later maladjustment and psychiatric disorder include emotional abuse (Chapman et al., 2004; Pietrek et al., 2013; Sareen, Fleisher, Cox, Hassard, & Stein, 2005), parental physical abuse (Kendler et al., 2000; Sareen et al., 2005; Sugaya et al., 2012; Yager, 2012), parental sexual abuse (Kendler et al., 2000; Mullen, Martin, Anderson, Romans, & Herbison, 1993; Sareen et al., 2005), parental alcohol abuse (Serec et al., 2012), parental substance abuse (Johnson & Leff, 1999; Osborne & Berger, 2009a), poor parenting (Jorm, Dear, Rodgers, & Christensen, 2003; Levitan, Rector, Sheldon, & Goering, 2003), divorce (Amato & Keith, 1991; Chase-Lansdale, Cherlin, & Kiernan, 1995; Cherlin, Chase-Lansdale, & McRae, 1998; Pryor & Rodgers, 2001), the number of changes in parental figures (Capaldi & Patterson, 1991), parental loss (Agid et al., 1999; Bifulco, Harris, & Brown, 1992), and parental psychopathology (Sareen et al., 2005).

While these childhood adversities each appear to be individually associated with later maladjustment and psychiatric disorder, studies have shown that a dose response relationship is present for the number of adversities reported and the risk for later psychopathology, with cumulative child adversity (where an individual is exposed to increasing numbers of child adversity factors) appearing to result in an increased risk of developing later psychopathology throughout the life course (Chapman et al., 2004; Hammen, Henry, & Daley, 2000; Schilling et al., 2008). Research using adolescent populations also indicates that the number of childhood adversities experienced acts in a cumulative fashion to increase the risk of psychiatric disorder, specifically during adolescence. Benjet et al. (2011) found that the odds of having a psychiatric disorder during adolescence increased with exposure to increasing numbers of adversities during childhood. These findings are consistent with those of Horwood and Fergusson (1998), who investigated the association between childhood adversity and adolescent mental health (during ages 16-18) in a New Zealand context using data from the Christchurch Health and Development Study (CHDS), a longitudinal study of a

birth cohort of 1265 children born in 1977. Horwood and Fergusson (1998) found very strong tendencies for risks of disorder to increase with increasing childhood adversity. Their research revealed that, of those with the highest childhood adversity scores, 94% met criteria for at least one psychiatric disorder, and over 70% met criteria for two or more disorders. In comparison, of those with the lowest adversity scores, less than 30% of met criteria for any psychiatric disorder and less than 10% for multiple disorders (Horwood & Fergusson, 1998). These findings are consistent with a developmental lifecourse perspective, particularly with the model of accumulation – in which exposure to disadvantageous experiences and environments accumulate, increases the risk of a certain health outcome, with adverse childhood experiences appearing to accumulate and increase the risk of psychiatric disorder in later life.

In addition to this cumulative effect, childhood adversities are often highly clustered, with considerable overlap, implying that those who have experienced one childhood adversity are likely to have been exposed to multiple childhood adversities (Agho, Stevens, Jacobs, & Raphael, 2012; Dong et al., 2004; Ney, Fung, & Wickett, 1994). This clustering of childhood adversities may have implications for studies that investigate the influence of single childhood family adversities on later mental health outcomes. Specifically, the effect of a single childhood adversity may be overestimated, as rather than representing the impact of a single childhood adversity, later outcomes may instead be due to the cumulative effect of multiple clustered adversities, or the influence of one or more correlated adversities that was not included in the study (Agho et al., 2012). This indicates that the investigation of multiple rather than single childhood adversities is necessary in order to avoid overestimating the influence of a single particular childhood adversity (Finkelhor, Ormrod, & Turner, 2007; Kessler, Davis, & Kendler, 1997; Mullen, Martin, Anderson, Romans, & Herbison, 1996). Findings have also indicated that childhood adversities are often nonspecific in their associations with various psychiatric disorders (Arata, Langhinrichsen-Rohling, Bowers, & O'Brien, 2007; Collishaw et al., 2007; Kessler et al., 1997). It is therefore beneficial to investigate multiple psychiatric outcomes so that overly narrow interpretations can be avoided.

In accordance with these findings, research has examined the association of multiple childhood adversities with a number of psychiatric outcomes. Large retrospective studies (Kessler, Angermeyer, et al., 2010; McLaughlin et al., 2010) show that childhood adversities may explain 29.8% - 32.4% of all mental disorders (including disruptive behaviour disorders, anxiety disorders, mood disorders, and substance use disorders). Findings also suggest that

childhood adversities are associated with mental disorder at all life-course stages, including childhood, adolescence, young adulthood and later adulthood (Kessler, Angermeyer, et al., 2010; McLaughlin et al., 2010). A 45-year longitudinal study by Clark, Caldwell, Power, and Stansfeld (2010) adds further support to the associations between childhood adversity and later psychiatric disorder. Clark et al. (2010) analysed data from 9377 cohort members of the 1958 British birth cohort and found that after adjusting for socio-economic position, childhood adversities were associated with psychopathology during adolescence (16 years, odds ratio (OR) of 5.56), early adulthood (23 years, OR 3.96), and mid-life (45 years, OR 3.68).

Available research focusing exclusively on adolescence has indicated that there is an association between childhood adversity and psychopathology, with significant associations having been found between childhood adversities and rates of both psychiatric disorder and adjustment problems during adolescence (Fergusson & Lynskey, 1995). Findings by Dunn et al. (2011) add further support to this association, with adolescents classed as having severe childhood adversity experiencing much higher odds of adolescent psychopathology compared to those who experienced low childhood adversity (ORs of 8 for disruptive behaviour disorders, 4.8 for depression and 2.0 for anxiety disorders). However these results may have been influenced by the fact that data regarding childhood adversities was collected predominantly from mothers, which may have resulted in the over- or under-reporting of some indicators (Fisher, Bunn, Jacobs, Moran, & Bifulco, 2011), and the misclassification of individuals' childhood adversity levels (low, moderate or severe).

Further research indicates that exposure to childhood adversity may explain a sizeable proportion of psychiatric disorder onset during adolescence. For example, in a study by McLaughlin et al. (2012), childhood adversities were found to be strongly associated with the onset of psychiatric disorders amongst adolescents, with population-attributable risk proportions indicating that in a predictive sense childhood adversities explain 28.2% of all psychiatric disorders, 15.7% of fear disorders (phobias and panic disorders), 32.2% of distress disorders (separation anxiety disorder, generalised anxiety disorder, posttraumatic stress disorder (PTSD), and major depressive disorder or dysthymia), 34.4% of substance use disorders and 40.7% of behavioural disorders (CD, oppositional defiant disorder, and attention-deficit/hyperactivity disorder). Collectively, these findings suggest that exposure to adversity during childhood is strongly associated with psychopathology during all stages of life, including adolescence, with exposure to childhood adversity during an individual's early

life course acting in a cumulative fashion to increase an individual's risk of psychopathology during adolescence and across the life-course.

1.5.4 Deviant Peer Affiliation

Deviant peer affiliation generally refers to the affiliation of an individual with friends that engage in delinquent or deviant behaviour (Snyder, Dishion, & Patterson, 1986). In previous research behaviour that has been considered delinquent or deviant has included: using drugs, drinking alcohol, smoking cigarettes, stealing, violent behaviour, criminal offending and truanting (Fergusson & Horwood, 1999; Heinze, Toro, & Urberg, 2004; Reedy & Saunders, 2013; Snyder et al., 1986). Two general processes regarding the associations between deviant peer affiliations and delinquent and antisocial behaviour have been proposed. First, the association could reflect a cause and effect linkage in which through higher exposure to delinquent peers, individuals are set on a life-course that has an increased involvement in crime and substance abuse, and this higher exposure leads to a higher likelihood of an individual developing deviant behaviour through socialisation processes (Fergusson, Swain-Campbell, & Horwood, 2002). An alternative explanation is that the association is non-causal and arises because of the selective processes in which children experience disadvantaged, dysfunctional, or disturbed backgrounds, which shifts their life course trajectory onto a path that has an increased likelihood of affiliation with delinquent peers (Fergusson & Horwood, 1999).

Irrespective of causality, affiliation with deviant peer groups is a common characteristic of adolescents at risk of alcohol and substance abuse (Fahnhorst & Winters, 2005; Fergusson et al., 2002; Gauffin, Vinnerljung, Fridell, Hesse, & Hjern, 2013), delinquency (including property crime and violent crime) (Fergusson et al., 2002; Haynie & Osgood, 2005; Keijsers et al., 2012), and other externalising behaviours (Barrera et al., 2002; Buehler, 2006; Dekovic, 1999; Fergusson et al., 2002; Keijsers et al., 2012). Deviant peer affiliation in adolescence has also been associated with adolescent depressive symptoms and internalising problems (Barrera et al., 2002; Dekovic, 1999; Fergusson, Wanner, et al., 2003), and higher levels of conduct disorder and oppositional defiant disorder (Boden et al., 2010).

These associations are supported in a review of 71 studies published post-1990 by Curcio, Mak, and George (2013). The authors examined risk factors for adolescent problem drinking and delinquency, including meta-analytic reviews. Curcio et al. (2013) found that attachment

to delinquent peers was the most frequently reported significant risk factor for adolescent delinquency (cited in 13 of 28 studies), and adolescent problem drinking (reported in 15 of 30 studies). The authors also found that attachment to delinquent peers was a significant risk factor in studies that concurrently investigated risk factors for both adolescent delinquency and adolescent problem drinking (cited in five of six studies).

1.6 Exposure to Risk Factors for Psychopathology Amongst New Zealand Māori

The research reviewed above documents clear links between early socioeconomic disadvantage, childhood adversity and psychopathology later in life; while deviant peer affiliation during adolescence has also been associated with adolescent maladjustment including substance abuse, depression, and antisocial and delinquent behaviours. The following paragraphs will explore whether there are ethnic differences in exposure to these indicators in a New Zealand context, with a focus on New Zealand Māori.

1.6.1 New Zealand Ethnic Differences in Exposure to Low SES

Available research indicates that in New Zealand, Māori are more likely to experience socio-economic disadvantage than non-Māori. Salmond and Crampton (2000) have indicated that a large proportion of Māori live in poverty, with Māori being under-represented in the top income quintiles and over-represented in the lower income quintiles. In addition to this, a study by Carter and Imlach Gunasekara (2012) using longitudinal data has found that low income rates were more prevalent amongst Māori respondents, and that Māori were more likely to have low income throughout the duration of the study, with 10.8% of Māori consistently having a low income across the study (2002-2010) compared to 5.3% NZ European and 7.7% of other ethnicities. In addition to income, Carter and Imlach Gunasekara (2012) also measured material signs of deprivation and found that approximately three times more Māori than NZ European were in deprivation throughout the study.

These findings are consistent with a recent report by Perry (2014) who found that an average of 28% of Māori were living in material hardship compared to 10% of NZ Europeans. Perry (2014) also found that poverty rates for those in the Māori ethnic group were found to be consistently higher than for those in the European/Pākeha ethnic group (approximately double), with 24% of Māori residing in households with incomes below the poverty line compared to 12% of NZ European/Pākeha. Māori children and adolescents are also more likely to be socioeconomically disadvantaged, with Māori children being more likely to be born into families of low SES, and experience poorer levels of family income and living

standards throughout childhood, including rates of poverty (Marie et al., 2014; Perry, 2014), with Perry (2014) finding that approximately 16% of NZ European/Pākeha children were found to be living in poor households, compared to 34% of Māori children. Ethnic differences on other socio-economic indicators also reveal that Māori children are more likely to be born to women of a younger maternal age (Cotterell & von Randow, 2008; Cribb, 2009), are more likely to live in sole parent families than non-Māori (Cotterell & von Randow, 2008; Cribb, 2009; Kiro, von Randow, & Sporle, 2010; Ministry of Justice, 2010), and are more likely to live with parents who have no formal educational qualifications (Ministry of Justice, 2010). Collectively, this research indicates that Māori are significantly more likely than non-Māori to be socioeconomically disadvantaged, with these socio-economic ethnic inequalities beginning in childhood and appearing to maintain throughout the life-course.

1.6.2 New Zealand Ethnic Differences in Exposure to Childhood Adversity

Available research indicates that Māori are also more likely to experience childhood adversity than their non-Māori counterparts. Wynd (2013) found that Māori were consistently over-represented in substantiated cases of child abuse, with data suggesting that Māori children were more than twice as likely to suffer child abuse as NZ European children. Dannette Marie, D. M. Fergusson, and Joseph M. Boden (2009) also investigated ethnic differences in child abuse and found that while Māori children were more likely to report harsh or abusive levels of physical punishment (14.0% of Māori, as compared with 5.5% of non-Māori), there were no significant ethnic differences in rates of childhood sexual abuse. Ethnic inequalities also appear to be present in other forms of childhood adversity, with Marie et al. (2009) finding that Māori were significantly more likely than non-Māori to be exposed to parental alcohol abuse (23.8% of Māori vs 10.7% of non-Māori), parental illicit drug use (38.7% of Māori vs 22.2% of non-Māori) and parental criminal offending (29.5% of Māori vs 11.2% of non-Māori). The same study also found that Māori have significantly greater levels of exposure to inter-parental violence during childhood, and on average had a significantly higher number of changes in parental figures. Marie et al. (2009) concluded that overall Māori were significantly more likely to experience poor family functioning (as measured by the above indicators) than non-Māori.

1.6.3 New Zealand Ethnic Differences in Deviant Peer Affiliation

At present, no research has been conducted into New Zealand ethnic differences in deviant peer affiliation, so it is not known if there are differences in deviant peer affiliation between

Māori and non-Māori adolescents. However, ethnic differences in deviant peer affiliation have been recorded by studies conducted in the USA, with these studies indicating that African - American youth (the ethnic minority) have higher levels of deviant peer affiliation than European – Americans (the ethnic majority) (Deutsch, Crockett, Wolff, & Russell, 2012; Haggerty, Skinner, McGlynn-Wright, Catalano, & Crutchfield, 2013).

Māori adolescents have been shown to have significantly higher rates of externalising disorders compared to their European New Zealand/Pākeha peers, including conduct disorder and substance abuse (Fergusson, Poulton, et al., 2003), both of which are associated with deviant peer affiliation. This known association between externalising disorders and deviant peer affiliation suggests that, as Māori have higher rates of externalising disorders, they may also have higher rates of deviant peer affiliation. This link is speculative however and further research is required to investigate whether this is the case.

1.7 Summary

Research has quite clearly established statistically significant and stable associations between exposure to socio-economic disadvantage during childhood and poor mental health outcomes during adolescence. There is also mounting evidence that there are higher rates of psychological disorder amongst adolescents who have been exposed to childhood adversity. Based on the findings of the research reviewed above, developmental life-course theory would propose that socio-economic disadvantage and childhood adversity may be early risk factors that place individuals on a pathway that is more likely to lead to psychological disorder in adolescence. As Māori have higher recorded rates of exposure to both of these early risk factors (childhood socio-economic disadvantage and childhood adversity), developmental life-course theory would indicate that Māori are placed on a life-course that has a higher risk of psychopathology during adolescence. Indeed, available data on prevalence rates of psychiatric disorder in New Zealand has revealed that Māori adolescents have higher prevalence rates of psychiatric disorder than their non-Māori counterparts. Further study is required to determine the magnitude of the effect of these risk factors.

One factor that also warrants further investigation is deviant peer affiliation. Deviant peer affiliation has been associated with psychological and behavioural maladjustment during adolescence. As of yet there is no current research regarding ethnic differences in exposure to deviant peer affiliation and the potential mediating effects this may have on the association

between Māori ethnicity and adolescent psychopathology. Overall, the link between Māori ethnicity and high rates of mental disorder during adolescence represents an important, yet under-researched issue that requires further attention. While some early risk factors for adolescent psychopathology have been identified, further research is needed to ascertain their role in mediating the link between Māori ethnicity and adolescent psychopathology. Further research is also required to identify if ethnic differences exist in other known risk factors for adolescent maladjustment, such as deviant peer affiliation, and to investigate whether these too mediate the link between Māori ethnicity and poor mental health outcomes in adolescence.

1.8 Limitations of Current Research

While research into risk factors for psychopathology in adolescent populations has clarified the links between childhood experiences of adversity, socioeconomic disadvantage and later mental health outcomes, some methodological problems exist that prevent firm conclusions being made regarding causality. Many of the studies reviewed above used cross-sectional designs, with retrospective reporting of childhood socio-economic conditions and childhood adversities. These methods can result in recall bias (Maughan & Rutter, 1997), and also prevent researchers from drawing firm conclusions regarding causality as it is difficult to ascertain temporal priority.

Another issue that arises in investigating SES and childhood adversity is that different studies have used different measures to ascertain different levels of childhood SES. For example, studies can focus on relatively specific indicators of SES (for example family income), or a range of forms of SES such as family income, parent occupation and level of the parent's highest educational qualification. Similarly there is a wide variety of indicators of childhood adversity that may be used to assess childhood adversity, with the particular indicators used differing between studies, making it difficult to ascertain if researchers are measuring the same associations.

An additional limitation to current research is that there are few studies available that have investigated ethnic differences in exposure to childhood socio-economic disadvantage and childhood adversity in New Zealand, and there is no research currently available that investigates ethnic differences in deviant peer affiliation and associations with adolescent mental health in a New Zealand context.

1.9 The Current Study

Against this general background, the current study has used longitudinal data collected from birth to age 21 years as part of the Christchurch Health and Development Study (CHDS) to examine the relationships between ethnicity, measured when cohort members were 14 years old, and mental disorder in later adolescence (15-18 years). In particular, this study examined whether the ethnic differences in rates of mental disorder during adolescence can be accounted for by the higher rates of exposure amongst Māori to early and concurrent risk factors for maladjustment and psychopathology. In order to achieve this, this study examined the extent to which associations between ethnicity and mental health were maintained after controlling for early socioeconomic factors, childhood adversity, and deviant peer affiliation in adolescence.

More specifically, the issues addressed in the present investigation can be divided into four primary aims:

(i) To examine the linkages between Māori ethnicity and rates of mental disorder during adolescence (ages 15-18 years)

(ii) To examine the extent to which any associations between Māori ethnicity and risks of mental disorders during adolescence are maintained after controlling for childhood socio-economic disadvantage

(iii) To examine the extent to which any remaining associations between Māori ethnicity and risk of mental disorders during adolescence are maintained after controlling for childhood adversity

(iv) To examine the extent to which any remaining associations between Māori ethnicity and risks of disorder during adolescence are maintained after controlling for deviant peer affiliation during adolescence

These aims required four stages of analysis and exploration:

i) Prevalence rates of mental disorder amongst Māori during adolescence (ages 15-18) were compared to those of non-Māori. It was hypothesised that Māori adolescents would have higher prevalence rates of mental disorder than their non-Māori counterparts.

ii) The socio-economic backgrounds of Māori and Non-Māori were compared. It was hypothesised that Māori would have more disadvantaged socio-economic backgrounds than non-Māori. The results from stage one were then adjusted to control for socioeconomic

background. It was hypothesised that this would further reduce the magnitude of the ethnic differences in prevalence rate of mental disorder during adolescence.

iii) The exposure of Māori to childhood adversity was then compared to that of non-Māori. It was hypothesised that Māori would have experienced more childhood adversity than non-Māori. The results from stage two were then adjusted to control for childhood adversity. It was hypothesised that this would further reduce the magnitude of the ethnic differences in prevalence rate of mental disorder during adolescence.

iv) The level of affiliation with deviant peers amongst Māori was then compared to that of non-Māori. It was hypothesised that Māori would have greater affiliation with deviant peers than non-Māori. The results from stage three were then adjusted to control for deviant peer affiliation. It was hypothesised that this would further reduce the magnitude of the ethnic differences in prevalence rate of mental disorder during adolescence.

Overall these analyses aimed to identify whether ethnic differences in adolescent mental health rates may be partially or fully explained by ethnic differences in exposure to known risk factors for maladjustment and psychopathology during adolescence (including Childhood SES, childhood adversity and deviant peer affiliation during adolescence).

2. Methods:

2.1 Data Source:

The Christchurch Health and Development Study (CHDS) is a prospective longitudinal study of a birth cohort of 1,265 Christchurch (NZ) born children who have been studied from birth to age 25 years. The sample for this study was recruited over a 4-month period during 1977 by contacting mothers of all live-born children giving birth in public and private maternity hospitals within the Christchurch urban region. Of the 1,310 mothers giving birth during this time, 97% agreed to participate.

These children and their families have now been studied at birth, 4 months, 1 year, at annual intervals to age 16, and again at ages 18, 21 and 25 years. The study has collected a wide range of data on the health, development, and adjustment of the cohort throughout this period. The CHDS has been approved by the Canterbury (New Zealand) Regional Ethics Committee, and all aspects of the data collection have been subject to the informed consent of the participants.

2.2 Characteristics of the Sample

The primary set of analyses in this study are based on 983 participants. This figure represents the sample for which data on both ethnicity at age 14 and outcome data from ages 14, 15 and 18 were available. The sex of the cohort members was coded at birth, with 50.55% of the sample being identified as male and 49.45% of the sample being identified as female. This sample represents 78% of the original 1,265 sample members. The ethnicity of cohort members was identified by their parents at age 14 on the basis of their response to the question, “Which of these categories best describes your child’s cultural identification?” If the parent’s answer indicated that their child’s ethnicity was Māori or part Māori, then the child was classified as Māori for the purposes of this study. If the parents response was European / Pākeha or any other ethnicity, than for the purposes of this study they were classified as non-Māori. By this measure of ethnicity 9.75% of cohort members were identified as being of Māori ethnicity and 90.25% of cohort members were identified as belonging to an ethnic group other than Māori (non-Māori). While there were participants of other minority ethnicities in the sample, their numbers were too small to allow comparative analysis, so the ethnic groups in this study have been restricted to those whose ethnicity was identified as Māori or part Māori (Māori ethnicity), and all other ethnicities (non-Māori).

Although there was insufficient data to describe the tribal affiliation (iwi) of the Māori cohort at age 14, at ages 21 and 25, cohort members who self-identified their ethnicity as either Māori or as Māori / other were asked to identify their iwi (tribal affiliation). The iwi affiliation of Māori cohort members at ages 21 and 25 are shown in Table 7 below and can be used as a loose estimate of the iwi affiliation of the Māori members of this cohort. The iwi described in the table are organised into a number of iwi regions using the classification from Statistics New Zealand (Statistics New Zealand, 2000). This classifies NZ into 11 iwi regions representing broad groupings of affiliated iwi. Table 7 shows the percentages of the sample (n=169) reporting each iwi. Note that percentages in the table sum to more than 100% since some respondents reported more than one iwi affiliation, with 57.3% reporting one iwi affiliation, 14.2% reporting two iwi affiliations and 2.3% reporting three iwi affiliations by age 25. As might be expected, the largest iwi grouping was from Te Waipounamu, with 42% of the sample reporting an affiliation with Ngāi Tahu/ Kāi Tahu. Sample members also reported affiliations with a broad range of North Island Iwi, with the most frequent of these being Ngā Puhi (11.8%) and Te Arawa (6.5%)

Table 7:

Percentage of Cohort Members Reporting Māori Ethnicity (n=169) at Ages 21 and 25 by Self-Reported Iwi Affiliation by Region[1]

Iwi Region / Affiliation	**%**	**Iwi Region / Affiliation**	**%**
<u>Te Waipounamu</u>		<u>Taranaki</u>	
Ngāi Tahu / Kāi Tahu	42.0	Ngāti Ruanui	1.1
Ngāti Māmoe	1.1	Ngā Raura	0.6
Total	43.2	Ngāti Kahu	0.6
		Ngāti Mutunga	1.1
<u>Te Tau Ihu</u>		Te Āti Awa	2.4
Rangitāne	0.6	Total	5.9
Ngāti Toa	1.1		
Total	1.8	<u>Whanganui</u>	
		Te Ati Hau Nui-A-Paparangi	0.6
		Total	0.6

Percentage of Cohort Members Reporting Māori Ethnicity (n=169) at Ages 21 and 25 by Self-Reported Iwi Affiliation by Region[1]

Iwi Region / Affiliation	**%**	**Iwi Region / Affiliation**	**%**
		Takitimu	
		Ngāti Kahungunu	4.1
Waikato		Total	4.1
Ngāti Paoa	0.6		
Ngāti Maniapoto	2.4	Mataatua	
Tainui	3.6	Ngāti Awa	1.1
Ngāti Hauā	1.8	Ngāi Tūhoe	0.6
Ngāti Raukawa	1.1	Te Whakatōhea	0.6
Total	8.9	Total	2.3
Rangitikei		Tairawhiti	
Ngāti Hauiti	0.6	Ngāti Porou	4.7
Total	0.6	Ngāti Tāmanuhiri	0.6
		Total	5.3
Arawa			
Te Arawa	6.5	Tai Tokerau	
Ngāti Tūwharetoa	4.1	Te Aupouri	0.6
Ngāti Whakaue	0.6	Ngā Puhi	11.8
Ngāti Pikiao	1.1	Te Rarawa	0.6
Tūhourangi	0.6	Total	14.2
Ngāti Rangiwewehi	0.6		
Total	13.0	No Iwi Affiliation Stated	26.0

1 only regions and iwi affiliations that were reported by the cohort have been listed in this table. Percentages sum to more than 100% as some respondents nominated more than one iwi affiliation.

At the time that the ethnicity data used in this study was gathered (when participants were age 14), the sample for which ethnicity data was available consisted of 995 participants. This sample represented 78.7% of the original cohort and 87.9% of the cohort still alive and resident in New Zealand. Table 8 divides the 270 participants lost to follow-up by the age of 14 years into reasons for non-participation.

Table 8:

Reasons for Losses to Follow-up at Age 14

	Reason	Number	Percentage of Losses
(i)	Subject No Longer in NZ	136	50.4
(ii)	Refusal to Participate	117	43.3
(iii)	Died by Age 14	17	6.3

The sample at age 18 represented 81% of the original cohort and 92% of the cohort still alive and resident in New Zealand. Table 9 divides the 240 subjects lost to follow-up by the age of 18 years into the reasons for non-participation. Over half of participants lost emigrated away from New Zealand, while over one third declined to participate. Death made up a further 8% of the sample loss, while two subjects were unable to be traced.

Table 9:

Reasons for Losses to Follow-up at Age 18

	Reason	Number	Percentage of Losses
(i)	Subject No Longer in NZ	135	56.3
(ii)	Refusal to Participate	83	34.6
(iii)	Died by Age 18	20	8.3
(iv)	Not Traced	2	0.8

A number of analyses have been conducted to examine the impact of selective sample attrition on design validity and to investigate the degree to which sample losses were non-random (Fergusson, Horwood, & Lloyd, 1991). These studies have indicated that there are small detectable tendencies for those lost to follow-up to come from a socially disadvantaged background characterised by single parenthood, limited maternal education, and low-socio-economic status. However, non-random sample losses have been taken into account through statistical corrections that have consistently shown the effects of selective sample attrition on the validity and conclusions of the study is negligible (Fergusson, 2001).

2.3 Procedure:

Data collection in the CHDS has been collected from several sources and is based on a multiple informant model. The main sources of data comprise of:

- *Parental interviews*. These were conducted with the child's mother, or in cases of single-parent families with a male parent, the child's father, at the child's home. The duration of interviews was generally one to two hours, with topics consisting of a range of issues pertinent to the child's stage of development.

- *Teacher reports*. From the age of 6 to 12 years, teacher reports on child social adjustment and academic achievement were acquired by providing all class teachers of CHDS children with a set of standardised questionnaires. Compliance was high with completed questionnaires being available for 98% of children in any given year.

- *Child assessments and interviews*. From the age of 8 to 18 years, children were questioned about a broad range of topics relevant to their stage of development.

- *Official records*. Further information obtained from official records including hospital notes, police records, and information from the school dental service supplemented the parent, self- and teacher assessments.

The CHDS was approved by the Canterbury (New Zealand) Regional Ethics Committee, and all aspects of the data collection were subject to the informed consent of the participants. This informed consent included the undertaking that no data associated with any individual or their family will be released without the individual's written consent, and all subjects were advised that they can withdraw their consent for the data to be analysed at any time. Computer records describing subjects were identified by an anonymous code number only, and linked to the individual's name by a master name code that was held by the CHDS and kept in a secure location. Parent and child interviews were administered separately, with the child's responses remaining confidential from their parent and vice versa.

2.4 Measures:

2.4.1 Mental Health Outcomes, Ages 15 and 16

When participants were aged 15 and 16 years, symptoms of psychiatric and behavioural disturbance were measured using an interview approach largely based on that used by McGee et al. (1990) in the Dunedin Multidisciplinary Health and Development Study (DMHDS), a parallel study of another cohort of New Zealand children. This was to ensure comparability between the findings of the two studies. Interviews were conducted with the child and the mother at different sites (mothers were interviewed at home and children at school), and by different interviewers. In all cases signed parental consent to interview the child was obtained. The instruments used in the study made it possible to assemble a series of items that were suitable for classifying adolescents according to DSM-III-R criteria (American Psychiatric Association, 1987). At age 18, subjects were questioned about their psychiatric symptoms, using a questionnaire based on the Comprehensive International Diagnostic Interview (CIDI) (World Health Organization, 1993), supplemented by an instrument based on the Self-Report Delinquency Instrument (SRDI) (Elliot & Huizinga, 1989), and questions about suicidal ideation. The measures used in this study are described in more detail below. These descriptions generally replicate previous accounts of these measures reported in papers published by the CHDS in an effort to maintain the veracity of the measures amongst available research and publications (as requested by the CHDS). The exact measures used are private to the CHDS and are therefore not available for replication in this study.

Major Depression

Major Depression at ages 15 and 16 was based on both the child report (15 items) and the parent report (16 items) including the abbreviated versions of the Diagnostic Interview Schedule for Children (DISC) (Costello, Edelbrock, Kalas, Kessler, & Klaric, 1982) used by McGee et al. (1990). Because the DISC version suitable for assessing DSM-III-R criteria was not available at the time this research was planned, the DISC items were supplemented by additional items designed to meet DSM-III-R criteria that were not covered in the original version of the instruments.

The DSM-III-R criteria for major depression include:

i. Depressed mood (or can be irritable mood in children and adolescents) most of the day, everyday
ii. Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly everyday
iii. Significant weight loss or weight gain when not dieting (e.g. more than 5% of body weight in a month), or decrease or increase in appetite nearly every day
iv. Insomnia or hypersomnia nearly every day
v. Psychomotor agitation or retardation nearly every day
vi. Fatigue or loss of energy nearly everyday
vii. Feelings of worthlessness or excessive and inappropriate guilt (which may be delusional) nearly everyday
viii. Diminished ability to think or concentrate, or indecisiveness, nearly every day
ix. Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide

To meet DSM-III-R criteria for major depression an individual must experience at least 5 of the above symptoms during the same two-week period, with at one of the symptoms being either 1. Depressed mood, or 2. Loss of interest or pleasure.

Participants responded to 15 items (child report) and their parent responded to 16 items (parent report) that assessed each of the DSM criteria in one or more ways. For both the child and parent report the items assessing sad or depressed mood for two weeks or longer, appearing moody or irritable for two weeks or longer, and loss of interest or pleasure in activities were scored on a 3 point Likert scale coded “No” (1), “Yes, perhaps” (2), and “Yes, definitely” (3). The remainder of the items were scored on a 4 point Likert scale coded “No” (1), “Perhaps” (2), “Definitely” (3), and “Not

applicable" (9). For the purpose of this study, participants were classified as having major depression at the ages of 15 (6.0% of the sample) and 16 (8.1% of the sample) if, on the basis of either parent or self-report, they met DSM-III-R symptom criteria for a major depressive episode over the last 12 months.

At age 18 major depression was assessed using CIDI items (33 items). Subjects were classified as having major depressive disorder if they met DSM-IV criteria (American Psychiatric Association, 1994) for at least one major depressive episode over the past year. DSM-IV criteria for major depression include:

i. Depressed mood most of the day, nearly every day
ii. Markedly diminished interest or pleasure in all or almost all activities most of the day
iii. Significant weight loss when not dieting, or weight gain, or decrease or increase in appetite nearly every day
iv. Insomnia or hypersomnia nearly every day
v. Psychomotor agitation or retardation nearly every day
vi. Fatigue or loss of energy nearly every day
vii. Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day
viii. Diminished ability to think or concentrate, or indecisiveness, nearly everyday
ix. Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide

To meet DSM-IV criteria for major depression, individuals must have five of the above symptoms present during the same 2-week period, with at least one of the symptoms being either (1) depressed mood or (2) loss of interest or pleasure. The symptoms must cause clinically significant distress or impairment in functioning and must not due to substance use, a medical condition, or bereavement.

Participants responded to 33 items that assessed each of the DSM-IV criteria in one or more ways. Items assessing sad or depressed mood for two weeks or longer and loss of interest or pleasure in activities were scored on a 2 point dichotomous measure coded "Yes" (1), or "No" (2). Questions relating to the number of episodes, length of longest episode (in weeks) and number of times episodes have coincided with physical illness or bereavement required the participant to respond by giving the

correct number, while questions regarding the extent to which these episodes interfered with functioning were measured with a 4 point Likert scale coded "Not at all" (1), "A little" (2), "A great deal" (3), and "Not applicable" (9). The remainder of the items assessing DSM-IV major depression criteria were scored on a 3 point scale coded "Yes" (1), "No" (2), and "Not applicable" (9). At 18 years of age 17.3% of the sample met criteria for major depression.

Anxiety Disorders

At age 15 and 16, anxiety disorders were based on both the child report and parent report abbreviated versions of the Diagnostic Interview Schedule for Children (DISC) (Costello et al., 1982) used by McGee et al. (1990). In both the parent report and child report measures items from the DISC were supplemented by items relating to generalised anxiety disorder from the Diagnostic Interview Schedule (DIS) (Robins, Helzer, Croughan, & Ratcliff, 1981). Because the DIS and the DISC versions suitable for assessing DSM-III-R criteria were not available at the time this research was planned, the DISC and DIS items were also supplemented by additional items designed to meet DSM-III-R criteria that were not covered in the original version of these instruments. At ages 15 and 16, participants were classified as having an anxiety disorder if, on the basis of either parent or self-report they met DSM-III-R symptom criteria for an anxiety disorder over the last 12 months. For the purposes of this study, at ages 15 and 16 these anxiety disorders included generalised anxiety disorder, overanxious disorder, separation anxiety, simple phobia and social phobia.

DSM-III-R criteria for separation anxiety include:

i. Unrealistic and persistent worry about possible harm befalling major attachment figures or fear that they will leave and not return
ii. Unrealistic and persistent worry that an untoward calamitous event will separate the child from a major attachment figure
iii. Persistent reluctance or refusal to go to school in order to stay with major attachment figures at home
iv. Persistent reluctance or refusal to go to sleep without being near a major attachment figure or to go to sleep away from home
v. Persistent avoidance of being along, including "clinging" to and "shadowing" of major attachment figures
vi. Repeated nightmares involving a theme of separation
vii. Complaints of physical symptoms, e.g. headaches or nausea on many school days or on other occasions when anticipating separation from attachment

figure

viii. Recurrent signs or complaints of excessive distress in anticipation of separation from home or major attachment figures, e.g., temper tantrums, pleading with parents not to leave

ix. Recurrent signs or complaints of excessive distress when separated from home or major attachment figures (e.g., wants to return home, needs to call parents.

An individual must experience or display three of the above criteria to meet the DSM-III-R classification of separation anxiety.

The DSM-III-R criteria for overanxious disorder include:

i. Excessive or unrealistic worry about future events
ii. Excessive or unrealistic concern about the appropriateness of past behaviour
iii. Excessive or unrealistic concern about competence in one or more areas (e.g. athletic, social)
iv. Somatic complaints, such as headaches or stomach aches, for which no physical basis can be established
v. Marked self-consciousness
vi. Excessive need for reassurance about a variety of concerns
vii. Marked feelings of tension or inability to relax

An individual must experience excessive or unrealistic anxiety or worry for six months or longer as indicated by the frequent occurrence of at least four of the above criteria to meet DSM-III-R criteria for overanxious disorder.

The DSM-III-R criteria for social phobia include:

a) A persistent fear of one or more situations in which the person is exposed to possible scrutiny by others and fears that he or she may do something or act in a way that will be humiliating or embarrassing.
b) If an Axis III or another Axis I disorder is present, the fear in A. is unrelated to it, e.g., the fear of having a panic attack (panic disorder), or trembling (Parkinson's disease)
c) During some phase of the disturbance, exposure to the specific phobic stimulus or stimuli almost invariably provokes an immediate anxiety response
d) The phobic situation(s) is avoided, or endured with intense anxiety
e) The avoidant behaviour interferes with occupational functioning or with usual

social activities or relationships with others, or there is a marked distress about having the fear

f) The person recognises that his or her fear is excessive or unreasonable
g) If the person is under 18, the disturbance does not meet criteria for avoidant disorder of childhood or adolescence

The DSM-III-R criteria for simple phobia include:

a) A persistent fear of a circumscribed stimulus (object or situation) other than fear of having a panic attack (as in panic disorder) or of humiliation or embarrassment in certain social situations (as in social phobia)
b) During some phase of the disturbance, exposure to the stimulus or stimuli almost invariably provoked an immediate anxiety response
c) The object or situation is avoided or endured with intense anxiety
d) The fear or the avoidant behaviour significantly interferes with the person's normal routine or with usual social activities or relationships with others, or there is marked distress about having the fear
e) The person recognises that his or her fear is excessive or unreasonable.
f) The phobic stimulus is unrelated to the content of the obsessions of obsessive-compulsive disorder or the trauma of post-traumatic stress disorder

The DSM-III-R criteria for Generalised Anxiety disorder include:

a) Unrealistic or excessive anxiety or worry (apprehensive expectation about two or more life circumstances, e.g. worry about finances (for no good reason), for a period of six months or longer, during which the person has been bothered more days than not by these concerns. In children and adolescents this may take the form of anxiety and worry about academic, athletic and social performance.
b) If another Axis I disorder is present, the focus of anxiety and worry in a) is unrelated to it
c) The disturbance does not only occur during the course of a mood disorder or a psychotic disorder
d) At least 6 of the following 18 symptoms are present when anxious:
   i. Trembling
   ii. Muscle tension, aches or soreness
   iii. Restlessness
   iv. Easy fatigability

v. Shortness of breath or smothering sensations
vi. Palpitations or accelerated heart rate
vii. Sweating or cold clammy hands
viii. Dry mouth
ix. Dizziness or light headedness
x. Nausea, diarrhea or other abdominal distress
xi. Flushes (hot flashes)
xii. Frequent urination
xiii. Trouble swallowing or 'lump in throat'
xiv. Feeling keyed up or on edge
xv. Exaggerated startle response
xvi. Difficulty concentrating or mind going blank
xvii. Trouble falling or staying asleep
xviii. Irritability

e) It cannot be established that an organic factor initiated or maintained the disturbance

Participants responded to 96 items (child report) and their parent responded to 96 items (parent report) that assessed each of the DSM criteria in one or more ways. For both the adolescent and parent report the items assessing the adolescent's fear of a certain stimulus were scored on a 3-point Likert scale coded "No" (1), "Somewhat" (2), and "A great deal" (3). Items investigating whether the adolescent experienced or displayed certain symptoms when worried or anxious were responded to on a dichotomous measure coded "Yes" (1), and "No" (2). Questions investigating whether the adolescent had experienced certain fears or worries over the past year required the parent or adolescent to identify which 3 month portion/s of the past year that these worries or anxieties had or had not been present, and were coded "No" (1), "Yes, but less than one month" (2), "Yes, more than a month" (3) or "All of the time" (4). The items that asked about the number of times the adolescent had experienced a panic or anxiety attack in the past year, and the largest number of attacks they have had in any four week period (over the last year) were count measures, while there was also an item that asked the respondent for a description of the adolescent's panic / anxiety attack. Respondents were also questioned around certain symptoms that were present when the adolescent was experiencing an anxiety or panic attack, with response options being coded "Yes" (1), "No" (2), or "Not applicable" (3).

Respondents were also asked if the adolescent was worried constantly about having another attack, to which the parent or adolescent could indicate either "Not worried" (1), Worried <1 month" (2), "Worried for > 1 month" (3), or "Not applicable" (9). The parent report version asked parents to identify which option best explains their adolescent child out of "Very anxious, worried" (1), "Tends to be a little anxious, worried" (2), "About average" (3), and "Not at all prone to fears and worries" (4), as well as asking whether their adolescent child constantly needed to be reassured about his/her worries or concerns, to which they could indicate either "No" (1), "Yes, somewhat" (2), or "Yes, definitely" (3). Whereas the adolescent self-report asked for the respondent to indicate if they worried about things either: "More than most people your age" (1), "About the same as other people your age" (2), or "Less than other people your age" (3), as well as requesting that they respond an item questioning whether when worried they ask someone (parents, friends, teachers), if things will be ok, by indicating either "Usually" (1), Sometimes" (2), or "Never" (3). Both the child and parent report also included items that asked respondents to describe the reaction the adolescent has to a feared situation, whether they seek to avoid this situation, whether their fear prevents them from doing things he/she would like to do, and whether the reaction to the feared situation is excessive or unreasonable. Overall, 10.9% of the sample was classified as having an anxiety disorder at age 15, and 21% of the sample were classified as having anxiety disorder at age 16.

At age 18 Anxiety disorders were assessed using CIDI items for generalised anxiety disorder, social phobia, specific phobia, panic disorder, and agoraphobia. The measure consisted of 114 items and participants were classified as having an anxiety disorder at age 18 if they met DSM-IV symptom criteria for generalised anxiety disorder, social phobia, specific phobia, panic disorder, or agoraphobia since the last assessment.

The DSM-IV criteria for panic disorder include:

a) Recurrent panic attacks
b) At least one of the attacks has been followed by 1 month (or more) of one (or more) of the following:
    i. Persistent concern about having additional attacks
    ii. Worry about the implications of the attack or its consequences (e.g., losing control, having a heart attack)
    iii. A significant change in behaviour related to the attacks

Individuals met the DSM-IV criteria for panic disorder if they meet criteria 1 and 2, and the panic attacks were not due to substance use or a medical condition, and are not better accounted for by another mental disorder. Panic disorder was able to be diagnosed both with and without agoraphobia.

The DSM-IV criteria for agoraphobia include:

a) Anxiety about being in places or situations from which escape might be difficult (or embarrassing), or in which help may not be available in the event of having an unexpected or situationally predisposed panic attack or panic like symptoms. Fears typically involve characteristic clusters of situations that include being outside the home alone; being in a crowd or standing in a line; being on a bridge; and traveling in a bus, train or automobile
b) The situations are avoided (e.g. travel is restricted) or else are endured with marked distress or with anxiety about having a panic attack or panic-like symptoms, or require the presence of a companion

The DSM-IV criteria for specific phobia include:

a) A marked and persistent fear that is excessive or unreasonable, cued by the presence or anticipation of a specific object or stimulus (e.g., flying or animals)
b) Exposure to the phobic stimulus almost invariably provokes an immediate anxiety response, which may take the form of a situationally bound or situationally predisposed panic attack
c) The person recognises that the fear is excessive or unreasonable
d) The phobic situation(s) is avoided or else is endured with intense anxiety or distress
e) The avoidance, anxious anticipation or distress in the feared situation(s) interferes significantly with the persons normal routine, occupational (or academic) functioning, or social activities or relationships, or there is marked distress about having the phobia

Individuals met the criteria for specific phobia if they experienced the above criteria and their anxiety, phobic avoidance or panic attacks were not better accounted for by another mental disorder.

The DSM-IV criteria for social phobia are the same as those of specific phobia, however rather than the stimulus being a particular object or situation (e.g., flying, heights, spiders), the individual instead has a marked or persistent fear of one or more social or performance situations in which the person is exposed to unfamiliar people or to possible scrutiny by others. The individual fears that she or he will act in a way or show anxiety symptoms that will be humiliating or embarrassing. The symptoms must not be due to the effects of substances, must not be due to or in relation to a medical condition, and must not be better accounted for by another mental disorder.

The DSM-IV criteria for generalised anxiety disorder include:

a) Excessive anxiety and worry (apprehensive expectation), occurring more days than not for at least 6 months, about a number of events or activities (such as work or school performance).
b) The person finds it difficult to control the worry
c) The anxiety and worry are associated with at least three (or more) of the following six symptoms (with at least some symptoms present for more days than not for the past 6 months)
    i. Restlessness or feeling keyed up or on edge
    ii. Being easily fatigued
    iii. Difficulty concentrating or mind going blank
    iv. Irritability
    v. Muscle tension
    vi. Sleep disturbance
d) The focus of the anxiety or worry is not confined to features of an Axis I disorder (e.g., the anxiety is not about having a panic attack (as in panic disorder)
e) The anxiety, worry or physical symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning

To meet DSM-IV criteria for generalised anxiety disorder an individual must meet the above criteria and the symptoms must not be due to substance use, a medical condition or occur exclusively during a mood disorder, a psychotic disorder or a pervasive developmental disorder. The participant responded to 113 items that had a

range of response formats. These included a 4 point Likert scale for inquiries regarding whether the respondent had worried about certain events, relationships or activities, and whether these worries had affected certain aspects of their life (e.g., relationships, paid employment), and were coded "Not at all" (1), "A little" (2), "A great deal" (3), and "Not applicable" (9), the response for whether the respondent feared a certain stimulus was dichotomous, and was coded "Yes" (1) and "No" (2). Items that questioned if the participant experiences certain symptoms when worried, when in certain situations, or during or after an anxiety or panic attack were coded "Yes" (1), "No" (2), or "Not applicable" (9), as were items that questioned a participant about whether the respondent avoided certain situations because of their fears, and whether they felt that their fear was so bad that they might lose control, go mad, or die. Items that asked how a participant's fears had affected their functioning also had a Likert scale response system and were coded "Not at all" (1), "Yes, somewhat" (2), "Yes, a great deal" (3), and "Not applicable" (9). There was also a four point Likert scale that asked whether a respondent's worries were about things that were likely to happen, and if these worries were about things that were not really serious, which was coded "No" (1), "Yes, perhaps" (2), "Yes, definitely" (3) and "Not applicable" (9). A count measure was used for the number of panic attacks the participant had experienced since the previous assessment, and the measure also included items that asked the participant to describe their feared stimulus, and the situation and nature of their anxiety / panic attacks. Overall 16.9% of the sample were classified as having an anxiety disorder at age 18 based on the DSM-IV criteria.

Suicidal Ideation

Suicidal ideation at 15, 16 and 18 was assessed by questioning sample members about the frequency and timing of any suicidal thoughts occurring in the interval since the previous assessment. The response to this item was either dichotomous (at age 15) coded "Yes" (1) or "No" (2), or was a 5 point Likert scale (ages 16 and 18) coded "Never" (1), "Once or twice" (2), "Quite Often" (3), "Very often" (4) or "All the time" (5). Using this information measures of suicidal ideation were constructed for ages 15, 16 and 18. Suicidal ideation was defined as having had suicidal thoughts in the last year. The percentage of the sample classified as having had suicidal ideation was 7.5% at age 15, 10.8% at age 16 and 11.3% at age 18.

Conduct Disorder

At ages 15 and 16, both the parent version and the self-report version of the Early Delinquency Scale (SRED) (Moffitt & Silva, 1988) was used to assess conduct disorder, following the approach used by McGee et al. (1990) in the DMHDS. Participants were classified as having conduct disorder if they met the DSM-III-R symptom criteria for conduct disorder.

The DSM-III-R criteria for conduct disorder are:

i. Has stolen without confrontation of a victim on more than one occasion (including forgery)
ii. Has run away from home overnight at least twice while living in parental or parental surrogate home (or once without returning)
iii. Often lies (other than to avoid physical or sexual abuse)
iv. Has deliberately engaged in fire setting
v. Is often truant from school
vi. Has broken into someone else's house, building or car
vii. Has deliberately destroyed other's property (other than by fire setting)
viii. Has been physically cruel to animals
ix. Has forced someone into sexual activity with him or her
x. Has used a weapon in more than one fight
xi. Often initiates fights
xii. Has stolen with confrontation of a victim (e.g. mugging, extortion)
xiii. Has been physically cruel to people

Participants and their parent both responded to 18 items that assessed each of the DSM criteria in one or more ways. For the child report the items assessing conduct disorder criteria asked how well the provided statements described the way the adolescent saw themselves with responses being scored on a 3 point Likert scale coded "Not like me" (1), "Like me a little" (2), and "Like me a lot" (3). The parent report items assessing conduct disorder criteria asked the extent to which the provided statements applied to the respondent's child, with responses being scored on a 3 point Likert scale coded "Doesn't apply" (1), "Applies somewhat" (2), and "Definitely applies" (3). At age 15 4.9% of the sample were classified as having conduct disorder, while 6.5% of the sample were classified as having conduct disorder at age 16.

At age 18 Conduct disorder was assessed using items from the SRDI that were administered to the participant. Subjects were classified as having conduct disorder if

they met the DSM-IV criteria for conduct disorder by reporting 3 or more of the 13 age-appropriate DSM-IV criteria.

The DSM-IV criteria for conduct disorder include:

i. Often bullies, threatens, or intimidates others
ii. Often initiates physical fights
iii. Has used a weapon that can cause serious physical harm to others (e.g., a bat or broken bottle)
iv. Has been physically cruel to people
v. Has been physically cruel to animals
vi. Has stolen while confronting a victim
vii. Has forced someone into sexual activity
viii. Has deliberately engaged in fire setting with the intention of causing serious damage
ix. Has deliberately destroyed others' property (other than by fire setting)
x. Has broken into someone's house, building or car
xi. Often lies to obtain goods or favours or to avoid obligations
xii. Has stolen items of nontrivial value without confronting a victim
xiii. Often stays out late at night despite parental prohibitions
xiv. Has run away from home overnight at least twice while living in parental or parental surrogate home (or once without returning for a lengthy period)
xv. Is often truant from school

Individuals meet DSM-IV criteria for conduct disorder if they meet three or more of the above criteria within the past 12 months.

Participants responded to 45 items that assessed each of the DSM-IV criteria for conduct disorder in one or more ways. The items asked if the respondent had performed any of the acts that constitute the criteria for conduct disorder over the last 12 months, with the participant's response being recorded as a count measure for the number of times they had performed the act in the last 12 months, or as zero if they had not preformed the act in question over the last 12 months. For the purposes of this study the criteria relating to "staying out late at night despite parental prohibition" and "often truants" were not included on the grounds that these items were not appropriate for the assessment of conduct disorder in 18-year-olds. 4.7% of the sample were classified as having conduct disorder at age 18.

Alcohol Abuse / Dependence

At ages 15 and 16, measures of alcohol abuse /dependence behaviours were obtained from self-report measure including custom written survey questions about the adolescent's use of alcohol and related matters, supplemented by the administration of the Rutgers Alcohol Problems Index (White & Labouvie, 1989).

Participants responded to a 37 item (child report) measure that assessed each of the DSM-III-R criteria in one or more ways. The adolescent was asked if they had experienced the criteria for alcohol dependence / abuse over the last 12 months. If the participant responded positively to one of the criteria they were asked about the number of times that they had experienced this criteria over the past 12 months, with this number being recorded as their response. If the participant indicated that they had not experienced this criteria than their number was recorded as zero. Alcohol abuse / dependence at ages 15 and 16 was also measured by custom written survey questions administered to the parent to measure their perceptions and knowledge of their adolescent's use of alcohol. The parents also responded to items with a number count, or by expressing their level of concern that their child might have an alcohol problem at present or in the future using 3 point scales coded "Not concerned (1), "Concerned" (2), and "Very concerned" (3) The criteria for alcohol abuse / dependence at ages 15 and 16 was that the adolescent met the DSM-III-R criteria for alcohol dependence / abuse.

The DSM-III-R criteria for alcohol dependence are:

i. Alcohol is often taken in larger amounts or over a longer period than the person intended
ii. Persistent desire or one or more unsuccessful efforts to cut down or control alcohol use
iii. A great deal of time spent in activities necessary to get alcohol (e.g., theft), drinking alcohol, or recovering from its effects
iv. Frequent intoxications or withdrawal symptoms when expected to fulfil major role obligations at work, school or home (e.g., does not go to school or work because they are hung-over, goes to work or school intoxicated), or when alcohol use is physically hazardous (e.g. driving while intoxicated).
v. Important social, occupational or recreational activities given up or reduced because of alcohol use
vi. Continued alcohol use despite knowledge of having a persistent or recurrent

social, psychological or physical problem that is caused or exacerbated by the use of alcohol (e.g. having an ulcer made worse by drinking)

vii. Marked tolerance: need for markedly increased amounts of alcohol in order to achieve intoxication, or markedly diminished effect with continued use of the same amount

viii. Characteristic withdrawal symptoms

ix. Alcohol often taken to relieve or avoid withdrawal symptoms

DSM-III-R criteria for alcohol dependence require that the participant meet at least three of the above criteria to be diagnosed with alcohol dependence.

The DSM-III-R criteria for alcohol abuse are:

a) A maladaptive pattern of alcohol use indicated by at least one of the following:
   i. Continued use despite knowledge of having a persistent or recurrent social, occupational, psychological, or physical problem that is caused or exacerbated by use of alcohol
   ii. Recurrent use in situations in which it is physically hazardous (e.g. driving while intoxicated)
b) Some symptoms of the disturbance have persisted for at least a month
c) Has never met the criteria for alcohol dependence.

At age 15, 3.6% of the sample met the criteria for alcohol abuse, while 5.4% met the criteria for alcohol dependence / abuse at age 16.

Age 18 Alcohol dependence / abuse was assessed with a 31 item measure using CIDI items. The measure consisted of 31 items. For 18 of the items the adolescent was asked if they had experienced the criteria for alcohol dependence / abuse over the last 12 months. If the participant responded positively to one of the criteria they were asked about the number of times that they had experienced this criteria over the past 12 months, with this number being recorded as their response. If the participant indicated that they had not experienced this criteria than their number was recorded as zero. For 13 of the items the participant's response was coded as either "Yes" (1), "No" (2), or "Not applicable" (3). Subjects were classified as showing alcohol dependence if they met the DSM-IV criteria for alcohol dependence:

The DSM-IV criteria for alcohol dependence include:

i. Increased tolerance for alcohol, demonstrated by either a need for markedly increased amounts of alcohol in order to achieve intoxication, or markedly diminished effect with continued use of the same amount
ii. Withdrawal, as manifested by either symptoms characteristic of alcohol withdrawal, or that alcohol is taken to relieve or avoid withdrawal symptoms
iii. The substance is often taken in larger amounts or over a longer period than intended
iv. There is a persistent desire or unsuccessful efforts to cut down or control alcohol use
v. A great deal of time is spent in activities necessary to obtain alcohol, use the substance, or recover from its effects
vi. Important social, occupational, or recreational activities are given up or reduced because of substance use
vii. The substance is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to be exacerbated by the substance

To meet DSM-IV criteria for alcohol dependence an individual needs to have experienced three or more of the above criteria at the same time in a 12-month period.

The DSM-IV criteria for alcohol abuse include:

i. Recurrent alcohol use resulting in a failure to fulfil major role obligations at work, school, or home (e.g., repeated absences from work or school)
ii. Recurrent alcohol use in situations in which it is physically hazardous (e.g. driving while intoxicated)
iii. Recurrent alcohol-related legal problems (e.g., arrests for alcohol related disorderly conduct)
iv. Continued alcohol use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance (e.g., arguments with family about consequences of intoxication)

To meet DSM-IV criteria for alcohol abuse, an individual must have experienced one or more of the above criteria and must never have met the criteria for alcohol abuse. For the purposes of this study alcohol abuse and alcohol dependence were combined into a single category including participants that met the criteria for either alcohol

abuse or substance abuse. 19.9% of the sample met the criteria for alcohol substance abuse / dependence at 18 years of age.

Illicit Substance Abuse / Dependence

Measures of illicit substance abuse behaviours were obtained from custom written survey questions administered to children about their use of these substances and related matters, and from a custom written survey question administered to the parent about the parent's perceptions and knowledge of the adolescent's use of these substances, to which they could respond by indicating on a 5 point scale the statement that they thought best described their child's use of substances, coded "Child is just experimenting out of curiosity" (1), "Child is beginning to become a drug user" (2), "Child is on way to using drugs regularly" (3), "Child is a regular drug user" (4), or "Not applicable" (5). Adolescent participants responded to 94 items that assessed each of the DSM-III-R criteria in one or more ways. The adolescent was asked if they had taken or used any illicit substances over the last 12 months. If the participant responded positively to having used one of the illicit substances they were asked about the number of times that they had experienced this criteria over the past 12 months, with this number being recorded as their response. If the participant indicated that they had not experienced this criteria than their number was recorded as zero. Participants were also asked questions around how they accessed the illicit substance (e.g. given by friends, bought by respondent), how they felt when they used the illicit substance (e.g. got really high, felt frightened), the reasons for their drug use and problems that the drug use had caused (e.g. getting into trouble at school or missing school because of drug use) and withdrawal and tolerance symptoms. The participant responded to these questions using a 3 point scale which was coded "Yes" (1), "No" (2), or "Not applicable" (9). Participants were asked if they think they will use the substance again, and responded using a 5 point scale coded "Definitely not" (1), "No" (2), "Yes, Perhaps" (3), "Yes, definitely" (4), and "Not applicable" (9). Participants also responded to a question about the frequency of their marijuana use by indicating on a 6 point scale either "Nearly every day" (1), "At least once a week" (2), "At least once a month" (3), "Less than once a month" (4), "Has only smoked once or twice" (5), and "Not used" (6). Participants were also asked to describe where they used the illicit substance and the surrounding circumstances. Participants were also asked about their own views on drug use to which they could choose a response from a four point scale coded "I will never take drugs" (1), "I probably will not take drugs" (2), "I may take drugs" (3), or "I will definitely take drugs" (4), and were asked about their

perception of how their parents would feel about their drug use by responding on a five point scale coded “Strongly opposed” (1), “Opposed” (2), “Would prefer you not use drugs” (3), “Would not mind you experimenting with drugs” (4), or “Don’t care how much you use drugs” (5). Participants also responded to questions asking if either their best friend or other friends used drugs (e.g. have any of your friends used cocaine?) and their views on drugs (e.g. My friend(s) think it’s all right to use drugs if you’re careful) by choosing a dichotomous “Yes” (1), or “No” (2) response.
The DSM-III-R considers that alcohol dependence and illicit substance dependence are both forms of substance dependence, and therefore the same criteria are used to assess either illicit drug dependence or alcohol dependence, depending on the substance. Therefore the DSM-III-R criteria for illicit substance abuse are similar to those used for alcohol abuse/dependence at age 15 and 16 (outlined in the above alcohol abuse / dependence measure), with reference to illicit substances rather than alcohol. The same is true for alcohol abuse and illicit substance abuse. 1.8% of the cohort were defined as having substance abuse at age 15, with 2.9% of the cohort abusing substances at age 16.

At age 18 participants responded to 46 items that assessed each of the DSM-IV criteria in one or more ways. The adolescent was asked if they had taken or used any illicit substances since the last assessment. If the participant responded positively to having used one of the illicit substances they were asked about the number of times that they had experienced this criteria over the past 12 months and since the last assessment, with these numbers being recorded as their responses. If the participant indicated that they had not experienced this criteria then their number was recorded as zero. The participant was also asked how often they use the substance, with their response on a 6 point scale being coded “Nearly every day” (1), “At least once a week” (2), “At least once a month” (3), “Less than once a month” (4), “Has only used once or twice” (5), and “Not used” (9). Participants were also asked if their substance use had resulted in problems (e.g. problems with you being at school / work, problems with your family), or had resulted in tolerance or withdrawal symptoms. Participants responded to these questions using a 3 point scale which was coded “Yes” (1), “No” (2), or “Not applicable” (9). The assessment of illicit substance abuse/dependence was based on CIDI items using DSM-IV criteria and was assessed using criteria similar to those used for alcohol abuse/dependence at age 18 outlined in the above alcohol abuse / dependence measure. The DSM-IV considers that alcohol

dependence and illicit substance dependence are both forms of substance dependence, and therefore the same criteria are used to assess either illicit drug dependence or alcohol dependence, depending on the substance. The same is true for alcohol abuse and illicit substance abuse, therefore the criteria used to assess illicit substance abuse are similar to the criteria for alcohol abuse listed in the alcohol abuse/dependence measure. For the purpose of this study illicit substance dependence and illicit drug abuse were combined into a single category, with both participants that met the criteria for either illicit substance dependence and illicit substance abuse being included. At age 18 11.2% of the sample met the criteria for illicit substance abuse/dependence.

It has been suggested that the instrumentation used in research conducted by the CHDS is somewhat piecemeal and that it would have been better to base prevalence estimates on the administration of a standardised interview designed specifically for the DSM-III-R. The piecemeal nature of the instrumentation can be explained in three ways. First, to ensure comparability with the findings reported by McGee et al. (1990), instrumentation used was generally comparable with the DMHDS research. Second, the present research was conducted in the context of a much wider longitudinal study in which it was necessary to have general-purpose instruments that could be used for DSM-III-R and DSM-IV criteria and other purposes. Third, as noted above, versions of the DISC suitable for assessing DSM-III-R criteria were not available to us at the time the research was planned, requiring custom-written items to supplement existing instrumentation so that aspects of DSM-III-R criteria not covered by the instruments were met.

With the exception of suicidal ideation, which is not considered a mental disorder by the DSM-III-R or DSM-IV, it was possible to assign children to DSM-III-R diagnostic categories using the parental and child report data for age 15 and 16. At age 18 DSM-IV categories were assigned using the self-report data gathered at this age. A full description of the construction of these diagnostic categories and the prevalence of these disorders within the cohort at age 15 years has been provided previously by Fergusson, Horwood, and Lynskey (1993).

2.4.2 Life-Course Covariates

To examine the life-course experiences that may possibly explain the associations between ethnicity at birth and later mental disorder, a number of variables were considered. These variables fitted into one of two categories: a) those that were known to be associated with ethnicity, and b) those that were likely to be predictors of adolescent mental health and could alternatively account for the association with ethnicity. These variables spanned a number of domains, namely: socio-economic disadvantage; childhood adversity and peer affiliation. The variables used in these analyses were selected from the database of the CHDS and were included based on their contribution to the final fitted Generalised Estimated Equation models. The details of each measure used in the subsequent analyses are described below. The descriptions of the following variables come directly from the Christchurch Health and Development study, and align with those used in previous publications.

Socio-Economic Status Measures:

The socio-economic background of cohort members was assessed using several indicator measures chosen from the database of the CHDS. The following variables have been used in previous literature as indicators of socio-economic disadvantage (Desai & Alva, 1998; Gaemmaghami et al., 2013; Scharte & Bolte, 2013), and are described below.

Maternal age at first childbirth: The age of the sample member's mother at first childbirth was given in whole years at the time of the survey child's birth. The mean maternal age at first childbirth was 25.8 (SD 4.9), with maternal ages ranging from 15 to 47.

Maternal education: Maternal level of education was assessed at the time of the child's birth. Mothers were coded from 1-3, reflecting the level of achievement attained. 1 was coded for no formal qualifications (51.2%), 2 was coded for high school qualifications (30.3%), and 3 was coded for tertiary level qualifications (18.6%). The mean maternal education level of this cohort was 1.68 (SD .77).

Family type at birth: The type of family (single parent family or two parent family) the child entered at birth was assessed at the survey child's birth. In this cohort, 92.3% of cohort members were born into two parent families and 7.7% of cohort members were born into single parent families.

Family socioeconomic Status: Family socio economic status at the time of the child's birth was assessed using the Elley and Irving (1976) scale of socioeconomic status for New

Zealand. This scale categorises families into six classes on the basis of paternal occupation whereby 1 = professional (10.8%), 2 = managerial (9.4%), 3 = clerical (24.3%), 4 = technical or skilled (28.5%), 5 = semiskilled (14.2%), and 6 = unskilled or unemployed (12.8%). In cases where the child's mother was a single parent, the occupational status of the child's natural father was used to obtain an SES code. The mean family socio-economic status class level amongst cohort members was 3.65 (SD 1.45). An account of the construction and validation of this scale is provided by Elley and Irving (1976).

Childhood Family Adversity Measures:

The degree of family adversity experienced by each of the cohort members during childhood was assessed using several indicator measures chosen from the database of the CHDS, including an omnibus family adversity measure and a series of discrete family adversity measures which included measures of child abuse / maltreatment, measures of parental maladaptive behaviour, family instability and the family's standard of living. These variables have been used in previous literature as indicators of childhood adversity and poor family functioning (Funk, Drew, & Knapp, 2012; Pietrek et al., 2013; Rosenman, 2006; Schilling et al., 2008; Shaw & Vondra, 1993). Descriptions of each measure are outlined below:

Omnibus family adversity measure (0−15 years): a measure of family adversity was calculated using a count measure of 38 different measures of family disadvantage during the period 0−15 years, including measures of disadvantaged parental background, poor prenatal health practices and perinatal outcomes, and disadvantageous child-rearing practices. The mean omnibus family adversity score amongst cohort members was 7.38 (SD 5.30), with scores ranging from 0 to 28. An account of the construction and properties of this measure is provided by Fergusson et al. (1994).

Discrete family adversity measures:

Childhood physical punishment / maltreatment. Exposure to childhood physical punishment/maltreatment was assessed at ages 18 and 21. Cohort members reported on the extent to which their parents used physical punishment during their childhood (prior to age 16 years). If applicable, separate ratings were made for mother figures and father figures. These ratings were then combined into a single four-point scale of parental physical punishment/maltreatment based on the most severe rating at either the 18- or 21-year interview: (a) parents never used physical punishment (4.5% of the sample); (b) parents seldom used physical punishment (78.0% of the sample); (c) at least one parent regularly

used physical punishment (11.2% of the sample); (d) at least one parent used frequent or severe punishment or treated the participant in a harsh/abusive manner (6.4% of the sample) (Fergusson & Lynskey, 1997). Ratings for both parents (if available) were combined into a single rating at each age by classifying the participants into one of the four groups based on the greatest level of exposure to physical punishment reported for either parent. The mean level of childhood punishment / maltreatment in this cohort was 2.81 (SD .61).

Childhood sexual abuse: Childhood exposure to sexual abuse was assessed at ages 18 and 21. Cohort members were questioned about their exposure to any forms of childhood sexual abuse prior to age 16; if anyone had ever attempted to involve them in any of a series of 15 sexual activities when they did not want this to happen. These activities included: (a) non-contact episodes involving indecent exposure, public masturbation or unwanted sexual propositions; (b) episodes involving sexual contact in the form of sexual fondling, genital contact or attempts to undress the respondent; and (c) episodes involving attempted or completed vaginal, oral or anal intercourse. Sample members who reported an incident of abuse were then questioned in depth about the context of the abuse including: the frequency of abuse episodes, the characteristics of the perpetrator(s), abuse disclosure and related factors (Fergusson, Horwood, & Lynskey, 1996; Fergusson, Lynskey, & Horwood, 1996). Using these data, participants were classified into one of four exposure groups reflecting the extent/severity of childhood sexual abuse reports: (a) no sexual abuse (85.9% of the sample); (b) non-contact sexual abuse only (2.7% of the sample); (c) contact sexual abuse not involving attempted or completed sexual penetration (5.1% of the sample); and (d) attempted or completed sexual penetration including vaginal, oral and anal intercourse (6.3% of the sample). This classification was based upon the most severe form of childhood sexual abuse reported at either age 18 or 21. The mean level of childhood sexual abuse experienced in this sample was .32 (SD.83).

The validity of this repeated measures assessment of reported childhood sexual abuse has been examined in previous papers using both a latent class analysis (Fergusson, Horwood, & Woodward, 2000), and a structural equation model designed to estimate the effects of current mental state on the reporting of childhood sexual abuse (Fergusson, Horwood, & Boden, 2011). These analyses showed that the effects of the respondents current mental state on their reporting of childhood sexual abuse were negligible, and that the retrospective reports of childhood sexual abuse have good validity as a measure of childhood sexual abuse (Fergusson et al., 2011; Fergusson et al., 2000)

Parental maladaptive behaviour:

Parental Alcohol Problems: At age 15 years the young person's parents were asked whether they had a history of alcoholism or problems with alcohol. These reports were combined to form a dichotomous measure of whether or not the young person's parents reported experiencing alcoholism or problems with alcohol. Based on this questioning, cohort members were coded as follows: 0 = no history of parental alcoholism/alcohol problems; or 1 = history of alcoholism/alcohol problems for at least one parent. On the basis of this questioning 12.1% of the sample were classified as having a parental history of alcohol problems.

Parental Criminal Offending: At age 15 years the young person's parents were asked if they had a record for criminal offending. A dichotomous measure was used to indicate whether or not the parent had a history of offending. Based on this information, cohort members were coded as follows: 0 = no history of parental criminality; or 1 = history of criminality for at least one parent. On the basis of this questioning 13.3% of the sample was classified as having parental history of criminality.

Parental Illicit Drug Use: When sample members were aged 11 years their parents were questioned about parental usage of illicit drugs including cannabis. Based on this questioning, cohort members were coded as follows: 0 = no history of parental illicit drug use; or 1 = history of illicit drug use for at least one parent. On the basis of this questioning, 24.9% of the sample was classified as having a parental history of illicit drug use.

Family instability:

Childhood parental change(s) (0–14 years). Comprehensive data on the child's family placement and changes of parents were collected at annual intervals from birth to age 14. To assess the extent of parental change, a measure of the child's exposure to parental change was constructed by counting the number of changes of parents (0–14 years). Parental change was defined as a parent: leaving the home as the result of separation/divorce/death, entering the home due to reconciliation/re-partnering, fostering, or any other change in the custodial parents. The mean number of changes of parent in this cohort (up to the age of 14) was .97 (SD 2.09), with the range from 0 to 27.

Standard of living:

Average family living standards (0–10 years). Interviewer ratings of family living standards were obtained at every year from 1 to 10 years. The family's living standards were assessed on a five-point scale that ranged from obviously affluent (1) to obviously poor (5). For the purposes of this analysis, these ratings were summed over the 10-year study period to obtain an overall assessment of family living standards during childhood, giving a minimum score of 10 and a maximum score of 50. The mean average standard of living for this cohort was 28.70 (SD 4.74), with a range in scores from 10 to 50.

2.4.3 Deviant Peer Affiliations:

Deviant peer affiliations consisted of a scale score measure of the young person's self-reported extent of affiliations with delinquent or substance using peers at ages 15, 16 and 18 years, with a higher score implying greater affiliation with deviant peers. This index was based on sample members' reports of the extent to which their best friend and other friends used tobacco, alcohol, and cannabis, truanted, or broke the law. These items were summed at each age, to produce a scale measure of the extent to which the sample member reported affiliating with delinquent or deviant peers.

The construction of this scale for ages 15 and 16 has been described previously in Fergusson and Horwood (1996), and was of moderate reliability, with an alpha coefficient of .76. For the purpose of the present investigation this measure was standardised to a mean of 100 and a standard deviation of 10. Amongst this cohort deviant peer affiliation scores ranged from 90.16 to 130.22 at age 15, from 86.19 to 124.90 at age 16, and from 85.59 to 145.66 at age 18.

2.5 Statistical Analysis.

Broadly speaking the purpose of these analyses was to estimate the size of association between ethnicity and mental health in adolescence and examine the roles of socioeconomic factors, family adversity and deviant peer affiliation as covariates. The following statistical analyses were conducted using the Statistical Package for the Social Sciences 20.0 (IBM SPSS, 2011). The statistical analyses involved three stages:

The first stage was to compute the unadjusted associations between Māori ethnicity and each mental health outcome assessed at ages 15, 16 and 18, including; major depression, anxiety disorders, suicidal ideation, conduct disorder, alcohol abuse / dependence, and substance

abuse / dependence, as well as the combined outcomes of internalising disorders (consisting of major depression, anxiety disorders and suicidal ideation) and externalising disorders (including conduct disorder, alcohol abuse / dependence and substance abuse / dependence) and any disorder (including major depression, anxiety disorders, suicidal ideation, conduct disorder, alcohol abuse / dependence, and substance abuse / dependence) . The bivariate analyses involved chi square tests to ascertain the prevalence rates of disorder at each age in the two populations (Māori and non-Māori). In addition to this, the population-averaged percentages for each mental health outcome across the study period (ages 15, 16 and 18) were calculated for both Māori and non-Māori. The population averaged percentage across the study period was estimated for each ethnicity by adding the number of cases for the chosen ethnicity over the entire study period (including ages 15, 16 and 18) and dividing this by the total number of respondents over the entire study period for the chosen ethnicity. This number was then multiplied by 100 to give the population averaged percentage.

A Generalised Estimating Equation (GEE) (Li, 2006; Liang & Zeger, 1986; Zeger & Liang, 1986) was then fitted to the repeated measures data. The GEE approach pooled the repeated measures on each outcome at ages 15, 16 and 18 years to produce an estimate of the population averaged effect for ethnicity on each outcome.

This stage of the analysis used a repeated measures GEE model. This analysis:

i. Tested the significance of the association between ethnicity and the mental health outcomes;
ii. Estimated the strength of association using risk ratio estimates, with odds ratios (OR) also calculated (using standard 95% confidence intervals).

The models fitted took the general form of Logit (Yit) = B0 + B1x1 + Ui

Where Yit is the log odds of each disorder (major depression, anxiety, suicidal ideation, conduct disorder, alcohol abuse / dependence and illicit substance abuse / dependence); B0 is the intercept term; B1 is the measure of ethnicity and Ui is the individual-specific error term. The parameter of B1 was then transformed to obtain estimates of the odds ratio and 95% Confidence Intervals by taking eB. Please note that the GEE models discussed above assume an absence of interaction between age and the effects of ethnicity, as well as gender and the effects of ethnicity. The GEE models were therefore also extended to include gender and age interactions to ensure that these assumptions were satisfied.

Prior to extending the GEE models to include covariate factors, ethnic differences were estimated between the Māori and non-Māori populations in this sample for each factor. These were calculated by fitting independent sample t-tests (for continuous measures) and chi-square tests (for dichotomous measures) to the data. Due to the fact that the variables that utilised t-tests were dichotomous measures and that the number of participants provided a sufficiently large sample size, estimates of Cohen's d were able to be calculated for the effect size (with a 95% confidence interval) of all covariate factors.

Cohen's d provides an estimate of effect size and was calculated using the formula:

$D = X1 - X2 / (\sqrt{sp2})$

Where X1 was the mean of group 1 (non-Māori), and X2 was the mean of group 2 (Māori), and sp2 was the pooled variance, with the mean of each group and the pooled variance being altered as appropriate for each particular variable.

The next stage of the analysis involved adjusting the associations between ethnicity and mental health outcomes including internalising disorders, externalising disorders, and any disorder. This analysis involved extending the GEE model in stage 1 above to include a series of socio-economic covariates. The model fitted was:

$\text{Logit}(Yit) = B0 + B1X1 + \Sigma BjZj$

Where Yit was the log odds of each disorder (major depression, anxiety, suicidal ideation, conduct disorder, alcohol abuse / dependence and Illicit substance abuse / dependence); B0 was the intercept term; B1 was the measure of ethnicity and ΣBjZj was the set of socio-economic measures in childhood including socio-economic level, maternal education level, maternal age at birth and single parent status at birth.

The associations between ethnicity and mental health outcomes were then further adjusted to include the omnibus measure of family adversity. The model fitted was:

$\text{Logit}(Yit) = B0 + B1X1 + \Sigma BjZj + B2X2$

With B2X2 which represents the omnibus measure of family adversity.

The Omnibus measure of family adversity was then removed from the model and replaced

with a series of discrete childhood adversity measures to compare the effect that each of these sets of measures had on the associations between ethnicity and mental health. The model fitted was:

$$\text{Logit}(Yit) = B0 + B1X1 + \Sigma BjZj + \Sigma BkZk$$

With $\Sigma BkZk$ representing the discrete measures of childhood adversity

The final step of the analysis involved adjusting the remaining associations between ethnicity and externalising disorders to include measures of deviant peer affiliation. The model fitted was:

$$\text{Logit}(Yit) = B0 + B1X1 + \Sigma BjZj + \Sigma BkZk + BqitXit$$

With BqitXit representing the standardised measure of deviant peer affiliation for individual i at time t (t = 15, 16 and 18 years).

2.6 Generalised Estimating Equation Model: Properties and Use

The current study aimed to investigate between group differences in mental health outcomes by comparing the mental health outcomes of Māori and non-Māori adolescents (ages 15, 16 and 18) by using the population averaged approach of generalised estimating equations (GEE).

While there are traditional epidemiologic methods that are essentially population-averaged approaches, such as stratified analysis (i.e., Mantel-Haenszel method (Mantel & Haenszel, 1959)) and standard logistic models for independent binary outcomes (Hosmer Jr & Lemeshow, 2004), these methods are usually not appropriate for correlated binary outcomes arising from longitudinal studies due to the dependency of the repeated measurements. The generalised estimating equations (GEE) approach was proposed by Liang and Zeger (1986) to estimate the population- averaged estimates while accounting for this dependency between the repeated measurements, Specifically, the dependency or correlation between repeated measures is taken into account by robust estimation of the variances of the regression coefficients (Hu, Goldberg, Hedeker, Flay, & Pentz, 1998). GEE is an extension of generalised linear models (GLM) for the analysis of longitudinal data and is deemed suitable for the analyses of repeated measures of binary variables in epidemiology (Hu et al., 1998).

Traditional analyses of these longitudinal studies have often been restricted to data obtained from baseline and one other time point. GEE models however, are able to utilise all available data and can produce more efficient estimates (Hu et al., 1998; Zeger & Liang, 1992). In GEE models, the correlation between measurements is modeled by assuming a working correlation matrix. This assumption eases the estimation of model parameters. Estimating the correct working correlation matrix provides efficiency parameter estimates. Even if it isn't correctly estimated, the model parameters from GEE tend to be consistent (Hardin, Hilbe, & Hilbe, 2007).

GEE models appear to be the more suitable choice for this study, as the research focus is on the population-average, and while random- effects models are appropriate for longitudinal data analysis when the research focus is on the change in individuals' responses, GEE models are the more appropriate when the objective is to make inference about group differences (Hu et al., 1998; Samur, Coskunfirat, & Saka, 2014). GEE also shows lower parameter estimates and standard errors than Generalized Linear Mixed Models (GLMM) (Samur et al., 2014), and while standard logistic models yields the same population- averaged estimates as the GEE with repeated binary outcomes, the standard errors from the standard logistic models are biased because the independence assumption is violated (Hu et al., 1998).

3. Results

3.1 Differences in Ethnic Groups at Birth

The aims of this chapter are to examine the associations between ethnicity and mental disorders. Initially we investigated whether there were any differences in the ethnic groups at birth. Table 10 shows that while there were no ethnic differences in the mean birth weight of Māori compared to non-Māori participants, there were ethnic differences in the level of maternal education, the maternal age at birth, and the mean number of cigarettes smoked during pregnancy. On average Māori mothers were younger at time of the cohort member's birth, had lower educational achievements and smoked a higher number of cigarettes per day. Two of these variables (Mean Maternal Education Level and Mean Maternal Age at Birth) were also included as covariates in later analyses.

Table 10:

Ethnic Differences (Māori vs Non-Māori) at Birth

	Māori	**Non-Māori**	**Cohen's *d* (95% CI)**	***p***
Mean Maternal Education Level	1.39 (0.62)	1.74 (0.79)	-0.45 (-0.58- -0.40)	.0001
Mean Maternal Age at Birth	23.15 (4.29)	26.06 (4.77)	-0.62 (-1.47- -0.30)	.0001
Mean Number of Cigarettes Smoked Daily During Pregnancy	6.79 (8.58)	3.48 (7.23)	0.45 (-1.26 – 0.92)	.0001
Mean Birth Weight	3355.15 (584.20)	3345.77 (556.86)	0.02 (-116.24-36.44)	.8753

3.2 Ethnic Differences in Rates of Psychiatric Disorder and Suicidal Ideation ages 15, 16 and 18

In the next series of analyses (findings presented in Tables 11 and 12), investigation is made into ethnicity by comparing Māori and non-Māori rates of psychiatric disorder and suicidal ideation. Table 11 shows the associations between ethnicity (classified as Māori and non-

Māori) and rates of psychiatric disorder (as classified by the DSM-III-R and DSM IV). For each disorder the table shows the rate of disorder expressed as a percentage for Māori and non-Māori, at ages 15, 16 and 18 years of age, as well as an estimate of the average over the study period for each disorder.

To test the significance of these differences, Generalised Estimate Equation Models (GEE models) were fitted to repeated measures data. This provided estimates of (i) the size of the associations between ethnicity and psychiatric disorder, recorded as odds ratios with a 95% confidence interval, and (ii) the statistical significance of these associations.

Table 11 shows that:

i) For both Māori and non-Māori rates of depression greatly increased between the 15 and 18 year assessments. However, Māori consistently had higher rates of depression across all ages from almost 1 in 10 at age 15 to over one in five at age 18. Overall Māori had odds of major depression that were 1.8 times higher than non-Māori (95% CI 1.19-2.64, P<0.05).
ii) While anxiety rates varied for both ethnicities over the course of the study, Māori had consistently higher rates of anxiety disorder, with average rates of anxiety disorders amongst Māori being approximately 4% higher than non-Māori during ages 15-16, and increasing to approximately 8% higher at age 18. Overall the odds of Māori having an anxiety disorder during adolescence were 1.4 times higher than those of non-Māori, with this ethnic difference in odds being marginally significant (95% CI 1.09-2.18, p=0.06).
iii) At age 15, the prevalence rate of suicidal ideation in Māori (7.7%) was similar to that of non-Māori (7.5%). However, the prevalence of suicidal ideation amongst Māori increased during ages 16 and 18, to be approximately 6% higher than that of non-Māori. These findings indicate that the odds of suicidal ideation are 1.5 times higher for Māori than for non-Māori, with ethnic differences in suicidal ideation being marginally significant (95% CI 0.99-2.41, p=0.06).
iv) Māori had much higher rates of conduct disorder than non-Māori throughout the course of the study. Māori were found to have rates of conduct disorder that were over double that of non-Māori at age 16, and over 3 times higher than non-Māori at ages 15 and 18, with Māori having odds of conduct disorder that were 3.5 times higher than non-Māori over the course of the study (95% CI 3.47-5.58, p<0.001).
v) Rates of alcohol abuse / dependence increased substantially over the course of the

study for both Māori and non-Māori participants. However Māori rates of alcohol abuse / dependence were consistently higher than non-Māori, with Māori on average having rates of alcohol abuse / dependence that were 6.5% higher than non-Māori over the course of the study. Overall Māori had odds of alcohol abuse / dependence that were 1.8 times greater than non-Māori (95% CI 1.19-2.79, $p<0.01$)

vi) For both Māori and non-Māori, the rates of illicit substance abuse / dependence had greatly increased at the18 year assessment in comparison to earlier assessments at age 15 and 16, however, Māori had much higher rates of illicit substance abuse / dependence than non-Māori, with approximately 1 in 5 Māori abusing or being dependent on illicit substances by age 18 in comparison to approximately 1 in 10 of non-Māori. Overall the odds of illicit substance abuse / dependence were 2.4 times higher amongst Māori in comparison to non-Māori (95% CI 1.41-3.94 $p<0.001$).

Table 11:

Ethnic Differences (Māori vs Non-Māori) in the Prevalence of Mental Disorder Amongst Adolescents Aged 15-18

Disorder	Age	Māori %	Non-Māori %	Māori: Non-Māori Unadjusted Odds Ratio (95% CI)	p.
Depression	Age 15	8.9	5.7		
	Age 16	12.6	7.7		
	Age 18	26.4	16.3		
Average Over Study Period (%)		16.0	9.9	1.77 (1.19-2.64)	.005
Anxiety	Age 15	14.3	10.5		
	Age 16	24.7	20.6		
	Age 18	24.2	16.1		
Average Over Study Period (%)		21.0	15.7	1.44 (0.98-2.11)	.062
Suicidal Ideation	Age 15	7.7	7.5		
	Age 16	16.9	10.2		
	Age 18	16.5	10.8		
Average Over Study Period (%)		13.7	9.5	1.54 (0.99-2.41)	.057
Conduct Disorder	Age 15	14.4	3.9		
	Age 16	13.6	5.7		
	Age 18	12.01	3.9		
Average Over Study Period (%)		13.4	4.5	3.47 (2.15-5.58)	<.001
Alcohol	Age 15	7.7	3.1		
	Age 16	11.2	4.8		
	Age 18	27.5	19.1		
Average Over Study Period (%)		15.5	9.0	1.82 (1.19-2.79)	.006
Illicit Substances	Age 15	6.3	1.4		
	Age 16	5.4	2.6		
	Age 18	19.8	10.3		
Average Over Study Period (%)		10.4	4.7	2.35 (1.41-3.94)	.001

For the purpose of subsequent analyses, the six disorder measures were used to classify participants on three dichotomous measures of disorder at ages 15, 16 and 18 years. These measures included the following: (a) Internalising disorders were classified for cohort members who met any criteria for major depression, anxiety, and suicidal ideation at each age. (b) Externalising disorders were classified for cohort members who met any criteria for conduct disorder, alcohol abuse / dependence, and illicit substance abuse / dependence at each age. (c) Any disorder was classified for cohort members who met any of the criteria for any of the above mental health issues at each age. For each of these measures, Table 12 shows the rate of disorder expressed as a percentage for Māori and Non-Māori, at ages 15, 16 and 18 years of age, as well as the average over the study period for each disorder category.

Table 12 shows that:

i) The rate of internalising disorders increased for both Māori and non-Māori over the course of the study. However while Māori rates of internalising disorders were only approximately 4% higher than those of non-Māori at age 15, ethnic differences in the rate of internalising disorders increased substantially by age 18, with Māori having rates of externalising disorders that were approximately 14% higher than non-Māori. Overall Māori had odds of Internalising disorders that were 50% higher than non-Māori (OR 1.5, 95% CI 1.07-2.01, $p<.05$).

ii) Ethnic differences in rates of externalising disorders were more consistent throughout the study, with Māori rates of externalising disorder ranging between being approximately 10-15% higher than those of non-Māori throughout the study. Overall, these results indicate that the odds of externalising disorder were 2.3 times higher for Māori than for non-Māori (95% CI 1.59-3.40, $p<.001$).

iii) Similarly, for the prevalence of any mental disorder, there was evidence of consistent differences between Māori and non-Māori at each age measured, with Māori having rates of any mental disorder ranging between approximately 6%-16% higher than those of non-Māori throughout the study. Overall the odds of Māori having any mental disorder during adolescence were 1.6 times greater than those of non-Māori (95% CI 1.14-2.19, $p<.01$).

The GEE models utilised in ascertaining the above results all assume the absence of interaction between age and the effects of ethnicity. To test these assumptions the GEE models were extended to include these interactions. These GEE models showed no

significant interaction effects for age and ethnicity, suggesting the assumptions of the GEE models were satisfied.

Table 12:

Ethnic Differences (Māori vs non-Māori) in the Prevalence of Mental Disorder Amongst Adolescents Aged 15-18 by Category of Mental Disorder

Disorder	Age	Māori %	Non-Māori %	Māori: Non-Māori Unadjusted Odds Ratio (95% CI)	p.
Internalising Disorders	Age 15	23.1	18.8		
	Age 16	36.0	29.7		
	Age 18	44.0	30.0		
Average (%)		34.3	26.1	1.50 (1.07-2.09)	.019
Externalising Disorders	Age 15	19.0	6.3		
	Age 16	19.4	9.5		
	Age 18	38.5	23.2		
Average (%)		25.4	12.9	2.33 (1.59-3.40)	<.001
Any Disorders	Age 15	28.4	22.0		
	Age 16	41.9	33.5		
	Age 18	58.2	42.3		
Average (%)		42.7	32.5	1.58 (1.14-2.19)	.006

3.3 Adjustments for Socioeconomic Disadvantage

One explanation for the ethnic differences observed in Tables 11 and 12 is that these differences reflect between-group differences in exposure to socioeconomic disadvantage. It has been well documented that Māori are at greater risk of experiencing socio-economic disadvantage than non-Māori (D'Souza, Turner, Simmers, Craig, & Dowell, 2012; Howden-Chapman, Blakely, Blaiklock, & Kiro, 2000; Mellsop, Trauer, & Eagar, 2006), and socio-economic disadvantage is a well known precursor to many mental health problems (Fergusson & Horwood, 2001; Manseau, 2014; Marie et al., 2014; McLeod & Shanahan, 1996; Mellsop et al., 2006). In order to examine this issue, Māori and non-Māori cohort members from the CHDS were compared across a series of measures of socio-economic disadvantage obtained during childhood, including family socio-economic status, single parent status at birth, maternal educational qualifications at birth, and maternal age at birth.

Table 13 shows that:

i) On the measure of family socio-economic status, Māori were more likely to occupy a lower socio-economic level than non-Māori. Findings indicate that there was a difference of 0.79 socio-economic levels between the average socio-economic level of Māori and the average socio-economic level of non-Māori (p<.001), generating a moderate effect size (d=.56)
ii) Māori mothers were also more likely to have a lower level of educational qualification than non-Māori, with Māori mothers on average having an educational qualification level of 1.39 compared to non-Māori who had an average educational level of 1.74 (p<.001), with a small effect size (d=-.47).
iii) On the measure of maternal age at birth, Māori were more likely to have their children at a younger age than their non-Māori counterparts (moderate effect size, d=-.62), with Māori mothers on average giving birth 2.9 years younger than non-Māori.
iv) Māori were also more likely to be a single parent at birth, with the number of Māori having single parent status at birth being 10.8% higher than that of non-Māori (p<.001, d=0.43)

Table 13:

Ethnic differences (Māori vs non-Māori) in Socio-economic Indicators

Variable	**Māori**	**Non-Māori**	**Cohen's d**	**p**.
Mean (SD) Socio-Economic Level	4.29 (1.38)	3.50 (1.41)	0.56 (0.29-0.65)	<.001
Mean (SD) Maternal Education Level	1.39 (0.62)	1.74 (0.79)	-0.45 (-0.58- -0.40)	<.001
Mean (SD) Maternal Age at Birth	23.15 (4.29)	26.06 (4.77)	-0.62 (-1.47- -0.30)	<.001
% Single Parent Status at Birth	16.5%	5.7%	0.43 (0.36-0.45)	<.001

The findings in Table 13 clearly suggest that one explanation of the higher mental health rates amongst Māori may be that the ethnic differences in mental health rates reflect the strong associations between ethnicity and social class. To examine this possible explanation, the association between ethnic identification and overall rates of mental health problems shown in Tables 11 and 12 were adjusted to take account of these socioeconomic factors. To achieve this, the GEE models presented in Tables 11 and 12 were extended to include these measures of socio-economic status of covariate factors. The model fitting proceeded in two stages: In the first stage the model was fitted using all four childhood socio-economic measures entered simultaneously (model 2). In the next step childhood socio-economic measures that were found to be statistically non-significant in the previous model were omitted, in order to obtain parameter estimates using only statistically significant measures of childhood SES. This modeling procedure produces more parsimonious and better fitting models. Table 14 shows the parameter estimates for these regression models.

Table 14:

Regression Parameters for the GEE Model Adjusting for Socio-economic Variables

	Model 1: Unadjusted			**Model 2:Adjusted for all Socio-Economic variables**			**Model 3: Adjusted for Significant Socio-economic Variables**		
	B	Standard Error	p.	B	Standard Error	p.	B	Standard Error	p.
Internalising Disorders[1]	.403	.1714	.019	.233	.1766	.186	.234	.2755	.183
Externalising Disorders[2]	.844	.1940	.000	.662	.1994	.000	.673	.1978	.001
Any Disorder[3]	.460	.1664	.006	.282	.1711	.099	.292	.1699	.086

1 Significant variables include Maternal Level of Educational Qualifications (p<.01) and Maternal Age at Birth (p<.01)

2 Significant and Marginally Significant variables include Maternal Level of Educational Qualifications (p=.104) and Maternal Age at Birth (p<.01)

3 Significant variables include Maternal Level of Educational Qualifications (p<0.01) and Maternal age at Birth (p<0.005)

From the parameters of the model, we can calculate estimates of the odds ratio using eB. The odds ratios for Māori ethnicity are shown in Table 15, which displays the odds ratios of mental disorders for Māori ages 15, 16 and 18 after adjustment for socioeconomic factors.

Table 15 shows that:

i) Adjustment for socioeconomic factors explained a substantial component of the association between cultural identification and internalising disorders, with the association between ethnicity and rates of internalising disorder reducing to non-significance after adjustment for significant childhood SES factors. Controlling for significant socio-economic factors reduced the odds of internalising disorders amongst Māori by 23% (OR 1.3, 95% CI 0.90-1.78, $p>0.10$).

ii) Adjustment for significant socioeconomic factors also explained a substantial component of the association between ethnicity and externalising disorders, with the odds of Māori having externalising disorders reduced from 2.3 times higher than non-Māori prior to adjustment, to 2.0 times higher than non-Māori after adjustment for significant socio-economic factors (CI 1.33-2.89, $p<0.001$). Nonetheless, despite this reduction in odds, the association between Māori ethnicity and rates of externalising disorder remained significant ($p<0.001$).

iii) Adjustment for socioeconomic factors accounted for a proportion of the association between ethnicity and mental disorder, and resulted in a 24% drop in the odds of Māori having any mental disorder. The association between ethnicity and rates of any mental disorder reduced to one of marginal significance, with Māori having odds of any mental disorder that were 1.3 times higher than non-Māori (CI 0.96-1.87, $p<0.10$) after adjustment for significant childhood SES factors.

Table 15:

Ethnic Differences (Māori vs. Non-Māori) for Internalising and Externalising Disorders Averaged Across 15-18 Years, Adjusted for Socio-economic Indicators.

Disorder	Model 1: Māori: Non-Māori Unadjusted Odds Ratio (95% CI)	p.	Model 2: Māori: Non-Māori Odds Ratio After Adjustment for All SES Factors (95% CI)	p.	Model 3: Māori: Non-Māori Odds Ratio After Adjustment for Significant and Marginally Significant SES Factors (95% CI)	p.
Internalising Disorders[1]	1.50 (1.07-2.09)	0.019	1.26 (0.89-1.79)	0.19	1.26 (0.90-1.78)	0.183
Externalising Disorders[2]	2.33 (1.59-3.40)	0.000	1.94 (1.31-2.87)	0.001	1.96 (1.33-2.89)	0.001
Any Disorders[3]	1.58 (1.14-2.19)	0.006	1.33 (0.95-1.85)	0.099	1.34 (0.96-1.87)	0.086

1 Significant variables include Maternal Level of Educational Qualifications (p<.01) and Maternal Age at Birth (p<.01)

2 Significant and Marginally Significant variables include Maternal Level of Educational Qualifications (p=.104) and Maternal Age at Birth (p<.01)

3 Significant variables include Maternal Level of Educational Qualifications (p<0.01) and Maternal age at Birth (p<0.005)

The results in Table 15 clearly showed that adjustment for significant and marginally significant socio-economic factors (including Maternal Level of Educational Qualifications (p<.01 – p=.104) and Maternal Age at Birth (p<.005-p<.01) reduced the magnitude of the associations between ethnicity and psychosocial outcomes, with the association between ethnic identification and internalising disorders being reduced to statistical non-significance ($p > 0.10$). While the association between Māori ethnicity and any mental disorder was reduced to marginal significance (p<.10), the association between Māori ethnicity and externalising disorders remained statistically significant after controlling for significant socio-economic factors, suggesting that while exposure to adverse socio-economic factors accounted for some of the ethnic differences in mental health outcomes during adolescence,

these factors did not fully explain the associations. These results also suggest that linkages between ethnicity and the measure of any disorder may be due to the association between ethnicity and externalising disorders.

3.4 Adjustments for Family Adversity

A further possible explanation for the ethnic differences observed in Tables 11 and 12 is that these differences reflect between-group differences in exposure to childhood adversity. It has been shown that Māori are at greater risk of experiencing greater childhood adversity than non-Māori, including abuse experienced during childhood, family dysfunction and instability, and parental maladaptive behaviour. (Hirini, Flett, Long, & Millar, 2005; D. Marie et al., 2009; Ministry of Social Development, 2010). Poor family functioning and child maltreatment is a well known precursor to many mental health problems (Cavanagh & Huston, 2006; Funk et al., 2012; Goldfeld & Hayes, 2012; Hibbard et al., 2012; Johnson & Leff, 1999; Mills et al., 2013; Osborne & Berger, 2009b; Osborne & McLanahan, 2007; Repetti, Taylor, & Seeman, 2002; Serec et al., 2012; Thompson et al., 2007; Trickett, Negriff, Ji, & Peckins, 2011; Verhulst, Oldehinkel, Ormel, & Bakker, 2012). Therefore associations between ethnicity and childhood adversity were considered. In order to examine these issues, a two stage anaytical strategy was adopted. In the first stage, ethnic differences were examined in an omnibus measure of family adversity. Then, the final fitted model described in Table 15 (model 3) was extended to include the omnibus measure of family adversity.

In the second stage of the analyses, we examined ethnic differences in a series of discrete measures of childhood adversity comprised of measures of parental maladaptive behaviour (including parental illicit drug use, parental alcohol abuse, and parental criminal behaviour), child maltreatment (including sexual abuse and physical abuse), family stability (measured by number of changes in parental figure up to 14 years), and standard of living (measured by the family's average standard of living when the child was aged 0-10). Again, the final fitted model in Table 15 (model 3) was extended to include these discrete measures of childhood adversity.

Results indicate that there were significant ethnic differences in family adversity with Māori having a significantly higher mean level of family adversity (*M* 11.52 *SD* 6.11) than non-Māori (*M* 6.92 *SD* 5.09, *d* 0.89, 95% CI -0.34 - 1.12, $p<.0001$) on an omnibus family adversity measure. These findings clearly suggest that one possible explanation of the higher

mental health rates amongst Māori is that the ethnic differences in rates of mental disorder at ages 15, 16 and 18 reflect the higher levels of exposure to family adversity amongst Māori cohort members.

To examine these issues, the associations between ethnic identification, overall rates of mental health problems, and significant and marginally significant socio economic factors shown in Tables 12, 13 and 15 were adjusted to take account of family adversity. To achieve this, the GEE models presented in Tables 12, 13 and 15 were extended to include the omnibus family adversity score as a covariate factor. Table 16 shows the parameter estimates for these regression models.

Table 16:

Regression Model Adjusting for Significant and Marginally Significant Socio-Economic Variables and an Omnibus Family Adversity Score

	Model 1: Unadjusted			**Model 3: Adjusted for Significant and Marginally Significant Socio-economic Variables[1]**			**Model 4: Adjusted for Significant and Marginaly Significant Socio-economic Variables[1] and an Omnibus Family Adversity Score**		
	B	Standard Error	p.	B	Standard Error	p.	B	Standard Error	p.
Externalising Disorders	.844	.1940	>.001	.673	.1978	>.001	.520	.2018	.010
Any Disorder	.460	.1664	.006	.292	.1699	.086	.0430	.1760	.807

1 Significant and marginally significant variables include Maternal Level of Educational Qualifications ($p<0.01$-$p=0.104$) and Maternal Age at Birth ($p<0.005$-$p<0.01$)

From the parameters of the model, we can calculate estimates of the odds ratio using eB. The odds ratios for Māori ethnicity are shown in Table 17, which displays the odds ratios of mental disorders for Māori aged 15, 16 and 18 after adjustment for socioeconomic factors and combined family adversity.

Table 17 shows that:

i) Adjustment for family adversity explained a further proportion of the association between ethnicity and externalising disorders, with the odds of Māori having

externalising disorders during adolescence decreasing by approximately 28%. Despite this reduction there was still a significant association between Māori ethnicity and externalising disorders, with the odds of externalising disorder during adolescence being 1.7 times higher for Māori than for non-Māori (CI 1.13-2.50, p=0.01)

ii) Adjustment for family adversity also explained a substantial component of the association between ethnicity and the prevalence of any mental disorder, with the odds of Māori having any mental disorder during adolescence dropping by 30%, reducing the association between Māori ethnicity and the prevalence of any mental disorder to non-significance (OR 1.0, 95% CI 0.74-1.47, p>.10).

Table 17:

Ethnic Differences (Māori vs. Non-Māori) for Externalising Disorders and any Mental Disorder Averaged Across 15-18 Years, Adjusted for Significant and Marginally Significant Socio-economic Indicators and an Omnibus Family Adversity Score

Disorder	Model 1: Māori: Non-Māori Unadjusted Odds ratio (95% CI)	p.	Model 3: Māori: Non-Māori Odds ratio After Adjustment for Significant and Marginally Significant SES Factors[1] (95% CI)	p.	Model 4: Māori: Non-Māori Odds Ratio After Adjustment for Significant and Marginally Significant SES Factors[1] and an Omnibus Family Adversity Score (95% CI)	p.
Externalising Disorders	2.33 (1.59-3.40	>.001	1.96 (1.33-2.89)	>.001	1.68 (1.13-2.50)	.010
Any Disorders	1.58 (1.14-2.19)	.006	1.34 (0.96-1.87)	.086	1.04 (0.74-1.47)	.807

1 Significant and marginally significant variables include Maternal Level of Educational Qualifications ($p<0.01$-$p=0.104$) and Maternal Age at Birth ($p<0.005$-$p<0.01$)

Adjustment for significant and marginally significant socio-economic factors and the omnibus measure of family adversity reduced the magnitude of the associations between ethnicity and psychosocial outcomes, with the association between ethnic identification and any mental disorder being reduced to statistical non-significance ($p<.10$). However, the association between Māori ethnicity and externalising disorders remained statistically significant after controlling for both socio-economic factors and family adversity, suggesting that while exposure to adverse socio-economic factors and family adversity accounted for some of the ethnic differences in mental health outcomes during adolescence, these factors did not fully explain the association between ethnic identification and externalising disorders, suggesting the presence of further factors.

As noted above, to examine the extent to which these findings were robust, alternative conceptualisations of the measure of family adversity were employed, and we conducted further analyses to identify whether a larger proportion of Māori were exposed to various forms of childhood adversity than their non-Māori counterparts using alternative measures of family functioning consisting of: measures of parental maladaptive behaviour (including parental illicit drug use, parental alcohol abuse, and parental criminal behaviour); measures of abuse (including childhood sexual abuse and childhood physical abuse); family instability (measured by number of change in parent); and standards of living (measured by the families average standard of living).

For the first three measures of childhood adversity, Table 18 shows the rate of exposure expressed as a percentage for Māori and Non-Māori obtained through chi square tests. For number of parental changes and average standard of living measures, an independent samples T-test was fitted to the data. This provided estimates of i) the number of parental changes and the average standard of living experienced, and ii) the effect size (in the form of Cohen's d) of the difference in mean number of parental changes and average standard of living between Māori and non-Māori.

Table 18:

Ethnic Differences (Māori vs Non-Māori) in Childhood Adversity Indicators

Variable	Māori	Non-Māori	Cohen's d	p.
Parental Illicit Drug Use	41.1%	23.0%	0.42 (0.32-0.45)	>.001
Parental Alcohol Abuse	24.5%	10.6%	0.43 (0.34-0.45	>.001
Parental Criminal Offending	27.7%	11.5%	0.48 (0.39-0.51)	>.001
Childhood Physical Abuse	2.62 (0.70)	2.82 (0.58)	-0.34 (-0.48- -0.30)	.002
Childhood Sexual Abuse	0.33 (0.83)	0.30 (0.82)	0.04 (-0.13-0.09)	.781
Mean Change in Parent	1.80 (2.21)	1.03 (2.06)	0.37 (-0.07-0.51)	>.001
Mean Average Standard of Living	31.31 (4.34)	28.27 (4.44)	0.69 (-0.18-0.98)	.001

The findings in Table 18 clearly support the suggestion that the higher rate of mental health problems amongst Māori could be due to the higher rates of exposure to poor family functioning and childhood adversity amongst Māori, with the exception of sexual abuse, where exposure of Māori to sexual abuse was at a similar rate to that of non-Māori. To examine these issues, the association between cultural identification and overall rates of mental health problems shown in Tables 12 and 15 were adjusted to take account of both the socioeconomic factors explored previously, and discrete measures of family functioning. To achieve this, the GEE models presented in Tables 12 and 15 were extended to include the discrete measures of family functioning in Table 18 (excluding sexual abuse for which there was no statistically significant difference between Māori and non-Māori). All variables were entered into the model in their original metrics. Table 19 shows the estimate parameters of these regression models.

Table 19:

Regression Parameters for GEE Model Adjusting for Significant and Marginally Significant Socio-Economic Variables and Significant Childhood Adversity Variables

	Model 1: Unadjusted			**Model 3: Adjusted for Significant and Marginally Significant Socio-economic Variables[1]**			**Model 5: Adjusted for Significant and Marginally Significant Socio-economic Variables[1] and Childhood Adversity Variables[2]**		
	B	Standard Error	p.	B	Standard Error	p.	B	Standard Error	p.
Externalising Disorders	.844	.1940	.000	.673	.1978	.001	.430	.2008	.032
Any Disorder	.460	.1664	.006	.292	.1699	.086	.002	.1732	.989

1 Significant and marginally significant variables include Maternal level of Educational Qualifications ($p<0.01$-$p=0.104$) and Maternal age at Birth ($p<0.005$-$p<0.01$)

2 Significant variables include Parental Illicit Drug Use, Parental Alcohol Abuse, Parental Criminal Offending, Childhood Physical Abuse, Mean Change in Parent and Mean Average Standard of Living ($p<.001$-$p<.005$)

From the parameters of the model, we can calculate estimates of the odds ratio using eB. The odds ratios for Māori ethnicity are shown in Table 20, which displays the odds ratios of mental disorders for Māori aged 15, 16 and 18 after adjustment for socioeconomic factors and the discrete family adversity factors.

Table 20 shows that:

i) Adjustment for discrete childhood adversity factors reduced the association between ethnicity and externalising disorders, with the odds of Māori adolescents having an externalising disorder decreasing by approximately 39%. Nonetheless, there was still a significant association between ethnicity and rates of externalising disorder, with Māori adolescents having odds of externalising disorder that were 1.5 times higher than non-Māori (CI 1.04-2.28, $p<0.05$)
ii) Adjustment for discrete childhood adversity factors resulted in an approximate 34% decrease in the odds of Māori having any mental disorder during adolescence, reducing the association between Māori ethnicity and the prevalence of any mental disorder to one of statistical insignificance (OR 1.0, 95% CI 0.71-1.41, $p>.10$)

Table 20:

Ethnic Differences (Māori vs. Non-Māori) for Externalising Disorders and Any Mental Disorder Averaged Across 15-18 Years, Adjusted for Significant and Marginally Significant Socio-Economic Indicators and Significant Childhood Adversity Indicators

Disorder	Model 1: Māori: Non-Māori Unadjusted Odds Ratio (95% CI)	p.	Model 3: Māori: Non-Māori Odds Ratio After Adjustment for Significant and Marginally Significant SES Factors[1] (95% CI)	p.	Model 5: Māori: Non-Māori Odds Ratio After Adjustment for Significant and Marginally Significant SES Factors[1] and Significant Childhood Adversity Factors[2] (95% CI)	p.
Externalising Disorders	2.32 (1.59-3.40)	0.000	1.96 (1.33-2.89)	0.001	1.54 (1.04-2.28)	.032
Any Disorders	1.583 (1.14-2.19)	0.006	1.34 (0.96-1.87)	0.086	1.00 (0.71-1.41)	.989

1 Significant and marginally significant variables include Maternal level of Educational Qualifications (p<0.01-p=0.104) and Maternal age at Birth (p<0.005-p<0.01)

2 Significant variables include Parental Illicit Drug Use, Parental Alcohol Abuse, Parental Criminal Offending, Childhood Physical Abuse, Mean Change in Parent and Mean Average Standard of Living (p<.001-p<.005)

Significant and marginally significant socio-economic variables adjusted for included Maternal level of Educational Qualifications (p<0.01-p=0.104) and Maternal age at Birth (p<0.005-p<0.01), while significant childhood adversity variables adjusted for included Parental Illicit Drug Use, Parental Alcohol Abuse, Parental Criminal Offending, Childhood Physical Abuse, Mean Change in Parent and Mean Average Standard of Living (p<.001-p<.005). Adjustment for significant and marginally significant socio-economic factors and

the significant discrete childhood adversity factors reduced the magnitude of the associations between ethnicity and psychosocial outcomes, with the association between ethnic identification and any mental disorder was also reduced to statistical non-significance (p>.10). However, the association between Māori ethnicity and externalising disorders remained statistically significant after controlling for both socio-economic factors and discrete childhood adversity factors (p<0.05), suggesting that while exposure to adverse socio-economic and discrete childhood adversity factors accounted for some of the ethnic differences in mental health outcomes during adolescence, these factors did not fully explain the association between ethnic identification and externalising disorders, suggesting the presence of further factors.

Both the omnibus family adversity measure and the discrete childhood adversity measures consist of similar factors that describe aspects of the family environment in which these participants developed. It is therefore not necessary to adjust for the combined family adversity measure and other alternate measures of family functioning and childhood adversity simultaneously as the measures are too similar, resulting in mis-specification.

As these measures make up similar factors, it is unsurprising that the outcomes of adjusting the associations between cultural identification, socioeconomic factors and the omnibus measure of family adversity are similar to the outcomes of the adjusted associations between cultural identification, socioeconomic factors and the discrete childhood adversity measures.

3.5 Peer affiliations

A further possible explanation for the remaining ethnic differences in the rate of externalising disorders observed in Tables 15, 17 and 20 is that these differences reflect between-group differences in deviant peer affiliation. Deviant peer affiliation is associated with many mental health problems, particularly externalising disorders (Andrews, Tildesley, Hops, & Li, 2002; Ary et al., 1999; Loke & Mak, 2013; Ramirez, Hinman, Sterling, Weisner, & Campbell, 2012). In order to determine whether deviant peer affiliation was contributing to ethnic differences in externalising disorders, we investigated if there were any noticable ethnic diffferences in deviant peer affiliation at ages 15, 16 and 18.In order to examine this issue, analyses were conducted using the previously described measure of deviant peer affiliation. Table 21 shows (i) the standardised mean number of deviant peer affiliations at each age and overall, and ii) the effect size (in the form of Cohen's d) of the difference in mean number of deviant peer affiliations between Māori and non-Māori at each age and overall.

Table 21:

Ethnic Differences (Māori vs non-Māori) in Peer Affiliation Ages 15, 16 and 18				
Variable	**Māori M (SD)**	**Non-Māori M (SD)**	**Cohen's d (95% CI)**	**p.**
Mean Standardised Deviant Peer Affiliation Age 15	105.53 (10.84)	99.42 (9.71)	0.62 (-1.60-1.27)	>.001
Mean Standardised Deviant Peer Affiliation Age 16	104.24(10.86)	99.56 (9.81)	0.47 (-1.78 – 1.13	>.001
Mean Standardised Deviant Peer Affiliation Age 18	103.48 (12.04)	99.63 (9.64)	0.39 (-2.08-1.04)	>.001
Mean Standardised Deviant Peer Affiliation All Ages	104.42 (11.25)	99.54 (9.72)	0.49 (-0.84-0.87)	>.001

The findings in Table 21 suggest that one possible explanation of the higher rates of externalising disorders amongst Māori may be that the ethnic differences in mental health rates reflect the strong associations between ethnicity and deviant peer affiliation throughout adolescence. To examine these issues, the associations between ethnic identification, overall rates of externalising disorders, socio economic factors, and the discrete childhood adversity factors shown in Table 20 were adjusted to take account of deviant peer affiliations. To achieve this, the GEE models presented in Table 20 were extended to include the measure of deviant peer affiliation as a covariate factor. The variables that were adjusted for in this final model were: significant and marginally significant socio-economic variables (including Maternal level of Educational Qualifications ($p=0.104$) and Maternal age at Birth ($p<0.005$-$p<0.01$)), significant childhood adversity variables (included Parental Illicit Drug Use, Parental Alcohol Abuse, Parental Criminal Offending, Childhood Physical Abuse, Mean Change in Parent and Mean Average Standard of Living ($p<.005$)), and Deviant Peer Affiliation. Table 22 shows the parameter estimates of these regression models. From the parameters of the model, we can calculate estimates of the odds ratio using eB. The odds ratios for Māori ethnicity are shown in Table 23, which displays the odds ratios of externalising disorders for Māori after adjustment for socioeconomic factors, discrete family adversity factors, and deviant peer affiliation.

Table 22:

Regression Parameters for GEE Model Adjusting for Significant and Marginally Significant Socio-Economic Variables, Significant Family Functioning Variables and deviant peer affiliation (15, 16 and 18)

	Unadjusted			**Adjusted for Significant and Marginally Significant Socio-economic Variables[1]**			**Adjusted for Significant and Marginally Significant Socio-economic Variables[1] and Childhood Adversity Variables[2]**			**Adjusted for Significant and Marginally Significant[1] Socio-economic Variables, Significant Childhood Adversity Variables[2] and Deviant Peer Affiliation (15, 16 and 18)**		
	B	Standard Error	p.	B	Standard Error	p.	B	Standard Error	p.	B	Standard Error	p.
Externalising Disorders	.844	.1940	.000	.673	.1978	.001	.430	.2008	.032	.265	.1985	.182

1 Significant variables include Maternal level of Educational Qualifications (p=.104) and Maternal age at Birth (p<0.005)

2 Significant variables include Parental Illicit Drug Use, Parental Alcohol Abuse, Parental Criminal Offending, Childhood Physical Abuse, Mean Change in Parent and Mean Average Standard of Living (p<.001-p<.005)

Table 23:

Ethnic Differences (Māori vs. Non-Māori) for Externalising Disorders Averaged Across 15-18 years, Adjusted for Significant and Marginally Significant Socio-Economic Indicators, Significant Childhood Adversity Indicators and Deviant Peer Affiliation

Disorder	Model 1: Māori: Non-Māori Unadjusted Odds Ratio (95% CI)	p.	Model 3: Māori: Non-Māori Odds Ratio After Adjustment for Significant SES Factors (95% CI)	p.	Model 5: Māori: Non-Māori Odds Ratio After Adjustment for Significant and Marginally Significant SES Factors[1] and Significant Childhood Adversity factors[2] (95% CI)	p.	Model 6: Māori: Non-Māori Odds Ratio After Adjustment for Significant and Marginally Significant SES Factors[1] , Significant Childhood Adversity Factors[2] and Deviant peer Affiliation (95% CI)	p.
Externalising disorders	2.33 (1.59-3.40)	.000	1.96 (1.33-2.89)	.001	1.54 (1.04-2.28)	.032	1.30 (0.88-1.92)	.182

1 Significant variables include Maternal level of Educational Qualifications (p=.104) and Maternal age at Birth (p<0.005)

2 Significant variables include Parental Illicit Drug Use, Parental Alcohol Abuse, Parental Criminal Offending, Childhood Physical Abuse, Mean Change in Parent and Mean Average Standard of Living (p<.001-p<.005)

The results in Table 23 show that adjustment for socio-economic factors, discrete childhood adversity factors, and deviant peer affiliation, including the odds ratios and significance levels for Model 1 (unadjusted), Model 3 (adjusted for significant socio-economic factors), Model 5 (adjusted for significant socio-economic factors and significant childhood adversity variables) and Model 6 (adjusted for significant socio-economic factors, significant childhood adversity variables and deviant peer affiliation). Model 2 was excluded as it adjusted for all socio-economic factors including non-significant socio-economic variables, while Model 4 was excluded as it adjusted for the omnibus family adversity measure.

Table 23 shows that adjustment for socio-economic factors, discrete childhood adversity factors, and deviant peer affiliation resulted in a small reduction in the association between ethnicity and externalising disorders, with the odds of Māori having an externalising disorder reducing by approximately 23%. Our findings indicate that once significant socio-economic factors, discrete childhood adversity factors, and deviant peer affiliation are controlled for, the association between Māori ethnicity and externalising disorders reduced to being statistically non-significant (OR 1.3, 95% CI 1.88-1.92, $p>.10$), suggesting that exposure to adverse socio-economic factors, discrete family adversity factors, and deviant peer affiliation account for the significant proportion of ethnic differences in mental health outcomes during adolescence.

3.6 Cross-Validation of Findings Using a Measure of Ethnicity Obtained at Age 21

Although a self-report measure of ethnicity was not available for this cohort during adolescence, a self-report measure of ethnicity was taken when the cohort was 21 years of age using the ethnicity questions from the 1996 New Zealand Census of Population and Dwellings (Statistics New Zealand, 1997). For the purposes of this study, those who identified their ethnicity as being solely Māori, or as being Māori / other ethnic affiliation were classified as Māori. Those who identified themselves as any other sole ethnicity or any other ethnic combination were classified as non-Māori. At age 21 11.28% of the sample were Māori and 88.72% of the sample were non-Māori.

As others' perceptions of an individual's race or ethnicity can differ substantially from self-reports of ethnicity, it has been proposed that self-report may be a more valid measure of

ethnicity than reliance on a report by others, such as the parent report used in the primary set of analyses (Harris & Sim, 2001). We therefore re-ran the analyses, replacing the parent report at age 14 ethnicity variable with the self-report measure of ethnicity taken at age 21 to cross-validate the results.

These cross-validation analyses were based on 1004 participants for whom both self-report ethnicity data at age 21, and outcome data at ages 15, 16 and 18 were available. The covariates are identical to those used in the earlier set of analyses that utilised the age 14 parent report ethnicity variable. Table 24 shows the regression parameters and the odds ratios for each model used in the analyses when using the self-report measure of ethnicity (age 21). The regression parameters and odds ratios for the initial analyses using the age 14 parent report ethnicity variable are also included to enable comparison between the two.
Table 24 shows that:

i. The unadjusted associations between Māori ethnicity and internalising disorders, Māori ethnicity and externalising disorders and Māori ethnicity and any mental disorder during adolescence are all statistically significant (ranging from $p<.001$ – $p<.05$) irrespective of the measure of ethnicity used.
ii. Adjusting for significant socio-economic factors reduces the strength of the associations between mental disorders and ethnicity, with associations between Māori ethnicity and internalising disorders and Māori ethnicity and any mental disorder reducing to statistical non-significance irrespective of the measure of ethnicity used (although the association between Māori ethnicity and any mental disorder remained marginally significant ($p<.10$) when using the age 14 parent report ethnicity variable).
iii. Adjusting for both significant SES variables and significant childhood adversity variables had a similar effect on the associations between Māori ethnicity and externalising disorders irrespective of which ethnicity measure was used, resulting in a reduction of the strength of these associations. Despite these reductions, the associations between Māori ethnicity and externalising disorders during adolescence remained significant when using either measure of ethnicity ($p<.05$).
iv. Adjusting for significant SES variables, significant childhood adversity variables, and deviant peer affiliation during adolescence resulted in the association between Māori ethnicity and externalising disorders reducing to statistical non-significance irrespective of which ethnicity variable was used (although the association between Māori ethnicity and externalising disorders remained marginally significant ($p<.10$) when using the age 21self-report ethnicity variable).

Table 24:

Regression Parameters and Odds Ratios for GEE models 1 Through 6, using Ethnicity Data From an Age 14 Parent Report Measure and an Age 21 Self-Report Measure

	Age 14 Parent Report Ethnicity Measure				Age 21 Self-Report Ethnicity Measure			
	B	**Standard Error**	**OR (95% CI)**	**p.**	**B**	**Standard Error**	**OR (95% CI)**	**p**
Model 1: Unadjusted								
Internalising Disorders	.403	.1714	1.50 (1.07-2.09)	.019	.346	.1619	1.41 (1.03-1.94)	.033
Externalising Disorders	.844	.1940	2.33 (1.59-3.40)	.000	.714	.1861	2.04 (1.42-2.94)	.001
Any Mental Disorder	.460	.1664	1.58 (1.14-2.19)	.006	.403	.1565	1.50 (1.10-2.03)	.010
Model 2: Adjusted for all Socio-economic Variables								
Internalising Disorders	.233	.1766	1.26 (0.89-1.79)	.186	.177	.1676	1.19 (0.86-1.66)	.290
Externalising Disorders	.662	.1994	1.94 (1.31-2.87)	.001	.566	.1923	1.76 (1.21-2.57)	.003
Any Mental Disorder	.282	.1711	1.33 (0.95-1.85)	.099	.243	.1617	1.28 (0.93-1.75)	.133
Model 3: Adjusted for Significant Socio-economic Variables[1]								
Internalising Disorders	.234	.2755	1.26 (0.90-1.78)	.183	.184	.1660	1.20 (0.87-1.66)	.268
Externalising Disorders	.673	.1978	1.96 (1.33-2.89)	.001	.580	.1903	1.79 (1.23- 2.59)	.002
Any Mental Disorder	.292	.1699	1.34 (0.96-1.87)	.086	.258	.1602	1.29 (0.95-1.77)	.108

Regression Parameters and Odds Ratios for GEE models 1 Through 6, using Ethnicity Data From an Age 14 Parent Report Measure and an Age 21 Self-Report Measure

	Age 14 Parent Report Ethnicity Measure				**Age 21 Self-Report Ethnicity Measure**			
	B	**Standard Error**	**OR (95% CI)**	**p.**	**B**	**Standard Error**	**OR (95% CI)**	**p**
Model 4: Adjusted for Significant Socio-economic Variables[1] and an Omnibus Family Adversity Score								
Externalising Disorders	.520	.2018	1.68 (1.13-2.50)	0.010	.457	.1978	1.58 (1.07-2.33)	.021
Any Mental Disorder	.0430	.1760	1.04 (0.74-1.47)	0.807	.051	.1692	1.05 (0.76-1.47)	.763
Model 5: Adjusted for Significant Socio-economic Variables[1] and Significant Family Functioning[2] Variables								
Externalising Disorders	.430	.2008	1.54 (1.04-2.28)	0.032	.449	.1920	1.57 (1.08-2.28)	.019
Any Mental Disorder	.002	.1732	1.00 (0.71-1.41)	0.989	-.005	.1655	0.10 (0.72-1.38)	.974
Model 6: Adjusted for Significant Socio-economic Variables[1], Significant Family Functioning Variables[2] and Deviant Peer Affiliation (at ages15, 16 and 18)								
Externalising Disorders	.265	.1985	1.30 (0.88-1.92)	0.182	.339	.1909	1.40 (0.97-2.04)	.076

1 Significant variables include Maternal level of Educational Qualifications ($p=.0.104$) and Maternal age at Birth ($p<0.005$)

2 Significant variables include Parental Illicit Drug Use, Parental Alcohol Abuse, Parental Criminal Offending, Childhood Physical Abuse, Mean Change in Parent and Mean Average Standard of Living ($p<.001$-$p<.005$)

Having cross validated the primary analysis by re-running the analyses using the self-report variable of ethnicity obtained when participants were 21 years of age, it is apparent that both sets of analyses lead to a consistent set of conclusions. Prior to adjustment, Māori ethnicity was related to significantly higher odds of (i) internalising disorders, (ii) externalising disorders, and (iii) any mental disorder during adolescence, with ORs ranging from 1.5 - 2.3 for the age 14 parent report ethnicity variable, and ORs ranging from 1.4 - 2.0 for the age 21 self-report ethnicity variable. After adjustment, in the final model including significant SES factors, significant childhood adversity factors and deviant peer affiliations during adolescence as covariates, the findings show that all associations between Māori ethnicity and mental health are reduced to statistical non-significance. These findings are consistent irrespective of the measure of ethnicity, suggesting that the findings are unlikely to be influenced by the ethnicity measure used.

4. Discussion

This study explored the relationships between ethnicity and mental disorder in adolescence using longitudinal data collected from birth to age 21 years as part of the Christchurch Health and Development Study. In particular, this study aimed to examine whether the ethnic differences in rates of mental disorder during adolescence (ages 15-18) can be accounted for by the higher rates of exposure amongst Māori to early and concurrent risk factors for maladjustment and psychopathology. To address this issue, four questions were considered. First the study examined ethnic differences in the prevalence rates of mental disorder during adolescence. Second, the extent to which the associations between ethnicity and mental disorder during adolescence were maintained after controlling for socio-economic disadvantage was explored. Third, this study examined the extent to which any remaining associations between ethnicity and mental disorder during adolescence were maintained after controlling for childhood adversity. Finally, this study examined the extent to which any remaining associations between ethnicity and mental health were maintained after controlling for adolescent deviant peer affiliation. We know from previous research that childhood socio-economic disadvantage and childhood adversity act as risk factors for mental disorder in later life, while adolescent deviant peer affiliation has been associated with maladjustment and psychopathology during adolescence. The current study examines the specific effects of exposure to these three risk factors on mental health outcomes amongst a cohort of Māori adolescents using a developmental life course perspective. The major findings and conclusions from this study are outlined below using a developmental life course perspective.

4.1 Ethnic Differences In the Prevalence of Psychiatric Disorders During Adolescence

The first stage of this analysis investigated ethnic differences in the rates of mental disorder during adolescence to ascertain whether there were indeed different rates of mental disorder amongst Māori when compared to non-Māori adolescents in this cohort. Consistent with available research, cohort members of Māori ethnicity were found to have significantly or marginally significantly higher rates of mental disorder during adolescence. These differences were evident for a range of outcomes, including Major Depression (16.0% Māori vs 9.9% Non-Māori, OR 1.8, 95% CI 1.19-2.64, $p<.01$), Anxiety Disorders (21.0% Māori vs 15.7% Non-Māori, OR 1.4, 95% CI 0.98-2.11, $p<.10$), Suicidal Ideation (13.7% Māori vs 9.5% non-Māori, OR 1.5, 95% CI 0.99-2.41, $p<.10$), Conduct Disorder (13.4% Māori vs

4.5% non-Māori, OR 3.5, 95% CI 2.15-5.58, $p<.001$), Alcohol abuse / dependence (15.5% Māori vs 9.0% non-Māori, OR 1.8, 95% CI 1.19-2.79, $p<.01$) and Substance abuse / dependence (10.4% Māori vs 4.7% non-Māori, OR 2.4, 95% CI 1.41-3.94, $p<.01$). When categorised into types of disorder, Māori had odds of internalising disorders that were 1.5 times higher than non-Māori (34.3% Māori vs 26.1% non-Māori, 95% CI 1.07-2.09, $p<.05$), odds of externalising disorder that were 2.3 times higher than non-Māori (25.4% Māori vs 12.9% non-Māori, 95% CI 1.59-3.40, $p<.001$) and odds of any mental disorder that were 1.6 times higher than non-Māori (42.7% Māori vs 32.5% non-Māori, 95% CI 1.14-2.19, $p<.01$). These results are consistent with reported findings from Te Rau Hinengaro: the New Zealand Mental Health Survey that found that Māori (ages 16 and older) had unadjusted rates of mental disorder that were 1.7-fold those of non- Māori (Baxter, Kokaua, et al., 2006), and findings from the Dunedin Multidisciplinary Health and Development Study which indicated that amongst adolescents aged 17 to 18, Māori had odds of any mental disorder that were 1.8 ($p <.05$) times higher than those of non-Māori (Fergusson, Poulton, et al., 2003).

Collectively, these findings indicate that there are significant ethnic differences in the rates of mental disorder amongst New Zealand adolescents. From a developmental life course perspective, one possible explanation for the higher rates of mental disorder amongst Māori is that Māori may have higher levels of exposure to risk factors for adolescent psychopathology throughout their life course. One such risk factor is socio-economic disadvantage during childhood.

4.2 Controlling for Ethnic Differences in Exposure to Socio-Economic Disadvantage During Childhood

The findings of this study suggest that there are significant ethnic differences in exposure to socio-economic disadvantage during childhood, with Māori on average having significantly poorer scores on all four of the childhood SES indicators utilised, including family socio-economic level at birth (*M* 4.29 *SD* 1.38 Māori vs *M* 3.50 *SD*1.41 non-Māori, *d* 0.56, $p<.001$), level of maternal education at birth (*M* 1.39 *SD* 0.62 Māori vs *M* 1.74 *SD* 0.79 non-Māori, *d* -0.45, $p<.001$), maternal age at birth (*M* 23.2 *SD* 4.29 Māori vs *M* 26.1 *SD* 4.77 non-Māori, *d* -0.62, $p<.001$), and single parent status at birth, (16.5% Māori vs 5.7% non-Māori, *d* 0.43, $p<.001$). These findings that Māori are more likely to be socio-economically disadvantaged during childhood are consistent with recent reports that found poverty rates for Māori children are consistently higher than for NZ European children, and that Māori children were more likely than non-Māori children to live in families experiencing material

hardship (Perry, 2014; Simpson et al., 2014). The results of this study also support findings that Māori children are more likely to be born to women of a younger maternal age, are more likely to live in sole parent families than non-Māori (Cotterell & von Randow, 2008; Cribb, 2009; Kiro et al., 2010; Ministry of Justice, 2010), and are more likely to live with parents who have no formal educational qualifications (Ministry of Justice, 2010).

As outlined above Māori are more likely to experience socio-economic disadvantage during childhood. It was hypothesised that as low childhood SES is a known risk factor for mental disorder during adolescence, this higher exposure to socio-economic disadvantage during childhood would account for some of the ethnic differences in rates of mental disorder during adolescence. Our findings indicate that this hypothesis was correct, as controlling for socio-economic factors consistently reduced the associations between Māori ethnicity and mental disorder during adolescence.

Statistical adjustment for significant socioeconomic factors explained a large proportion of the associations between Māori ethnicity and mental disorder. This was especially the case in regards to internalising disorders, with the association between ethnicity and internalising disorders being reduced to one of statistical insignificance (OR 1.3, 95% CI 0.90-1.78, $p>.10$), suggesting that childhood socio-economic disadvantage places individuals at considerable risk of internalising disorders during adolescence. These findings are not unique, with Najman et al. (2010) finding that family poverty in childhood predicted higher rates of adolescent and young adult anxiety and depression, Spence, Najman, Bor, O'Callaghan, and Williams (2002) finding that poverty during childhood resulted in a small but significant increased risk of anxiety-depression symptoms during adolescence, and Foley, Goldston, Costello, and Angold (2006) finding associations between poverty and suicidality in children and adolescents.

Adjustment for socio-economic factors also markedly reduced the magnitude of the associations between Māori ethnicity and externalising disorders, and Māori ethnicity and the prevalence of any mental disorder, suggesting that exposure to socioeconomic disadvantage during childhood is a risk factor for mental disorder and externalising disorders during adolescence. Such findings are comparable to those of other studies, with Shapero and Steinberg (2013) analysing data from the longitudinal Study of Early Child Care and Youth Development (SECCYD), and finding that low household income during childhood predicted higher levels of internalising and externalising problems during adolescence. These findings are also consistent with those of Huisman et al. (2010), who used data from two longitudinal

studies (the Avon Longitudinal study of Parents and Children (ALSPAC), and the Tracking of adolescents individual lives survey (TRAILS), and found that low SES during childhood (measured using maternal education and household income level) was associated with externalising problems during adolescence.

Collectively these findings suggest that, from birth, Māori are more likely to encounter risk factors for adolescent psychopathology, with our findings indicating that Māori are more likely to be born into an environment of socio-economic disadvantage. This early risk factor has the potential to negatively alter the trajectory of young Māori onto a pathway that is more likely to eventuate in poor mental health outcomes during adolescence.

However, while the findings of this study indicate that controlling for childhood SES has had a confounding effect on the associations between Māori ethnicity and mental disorder during adolescence, not all of the ethnic differences in mental disorder during adolescence can be explained in socio-economic terms, as two of the associations between Māori ethnicity and mental disorder remained significant or marginally significant, with Māori adolescents having odds of externalising disorders that were 2.0 times higher than non-Māori (CI 1.33-2.89, $p \leq .001$), and odds of any mental disorder that were 1.3 times higher than non-Māori (CI 0.96-1.87, $p < .10$) once socio-economic disadvantage was controlled for.

These remaining marginally significant and significant associations indicate that there are other contributing factors to ethnic differences in adolescent mental health outcomes. One such factor that may be influencing the higher rates of mental disorder amongst Māori adolescents is the possibility that they have higher exposure to childhood adversity, which is another known risk factor for mental disorder during adolescence.

4.3 Controlling for Ethnic Differences in Exposure to Childhood Adversity

Our results indicated that in this cohort, while Māori were more likely to be exposed to other forms of childhood adversity, there were no significant ethnic differences in the levels of childhood sexual abuse experienced by Māori and non-Māori participants (*M* 0.33 *SD* 0.83 Māori vs *M* 0.30 *SD* 0.82 non-Māori, *d* .04, $p > .10$). These results diverge from previous findings, which found higher rates of sexual abuse amongst Māori in comparison to Non-Māori (Crengle et al., 2013; Families Commission, 2009; Lievore, Mayhew, & Mossman, 2007). There are no clear reasons for these differences in findings, however they may possibly occur as a result of sample selection factors. For example, a study conducted by Fanslow, Robinson, Crengle, and Perese (2007), which found that Māori women were twice

as likely to have self-reported experiences of childhood sexual abuse than non-Māori women used a selected sample that was not representative of the population in general. In contrast, the CHDS results are based on a representative birth cohort of children born in Christchurch in 1977. Different sampling methods therefore provide one possible explanation for the inconsistency in findings regarding the links between ethnicity and childhood sexual abuse. Another possible reason for the difference in findings is the suggestion that Māori families may be more likely to come to the attention of child care professionals and protection agencies (Cram, 2012; Taonui, 2012), which may resulting in the over- reporting of cases of child sexual abuse involving Māori children. This explanation needs more investigation however, and remains speculative.

Although there was no detectable association between ethnicity and childhood sexual abuse, ethnic differences were found for a range of other childhood adversities, with Māori being significantly more likely to have experienced parental substance abuse (41.1% Māori vs 23.0% Non-Māori, *d* 0.42, $p<.001$), parental alcohol abuse (24.5% Māori vs 10.6% non-Māori, *d* 0.43, $p<.001$), parental criminal offending (27.7% Māori vs 11.5% non-Māori, *d* 0.48, $p<.001$), and on average having worse levels of childhood physical abuse (*M* 2.62 *SD* 0.70 Māori, vs *M* 2.82 *SD* 0.58 non-Māori, *d* -.34 $p<.01$), higher number of changes in parent (*M* 1.80 *SD* 2.21 Māori vs *M* 1.03 *SD* 2.06 non-Māori, *d* 0.37, $p<.001$), and a worse average standard of living (*M* 31.31 *SD* 4.34 Māori vs *M* 28.27 *SD* 4.44 non-Māori, *d* 0.69, $p<.001$) than their non-Māori counterparts.

These findings are consistent with reports that Māori are overrepresented amongst maltreated children, with Māori youth making up approximately half of all children and young people that were found to have experienced emotional abuse, neglect or forms of abuse (Families Commission, 2009), and align with the fact that Māori adults (presumably inclusive of parents), are more likely to have alcohol and substance abuse problems (Adamson, Sellman, Deering, Robertson, & de Zwart, 2005; Bramley, Broad, Harris, Reid, & Jackson, 2003) and are more likely to have had involvement with the criminal justice system (Doone, 2000).

Our findings indicate that these higher levels of exposure to childhood adversity experienced by Māori are contributing to the higher rates of mental disorder amongst Māori adolescents, with associations between Māori ethnicity and mental disorder during adolescence being further reduced in magnitude once childhood adversity was controlled for. Specifically, the association between Māori ethnicity and externalising disorders was noticeably reduced (OR 1.5, 95% CI 1.04-2.28, $p<.05$), while the prevalence of any mental disorder during

adolescence was reduced to statistical non-significance (OR 1.0, 95% CI 0.71-1.41, $p>.10$).

These findings confirm that childhood adversity is a risk factor for mental disorder during adolescence, and are consistent with findings from an 18-year longitudinal study by Brook, Johnson, Kasen, Smailes, and Cohen (2001), that found significant associations between maladaptive parental behaviour and an increased risk of psychiatric disorder during late adolescence and those of a longitudinal study performed by Herrenkohl and Herrenkohl (2007), who found that exposure to childhood adversities (including physical abuse, neglect and exposure to domestic violence) predicted internalising and externalising behaviours in adolescence.

From these findings, it would appear that as young Māori progress through their life-course they are more likely to be exposed to adverse factors and environments throughout childhood, including parental maladaptive behaviour (parental criminal offending, parental alcohol abuse and parental substance abuse), maltreatment (physical child abuse), family instability (changes in parent figure), and lower standards of living (average standard of living). These adverse experiences during childhood are known to have a cumulative effect (Agho et al., 2012), with a higher number of childhood adversities resulting in a higher risk of mental disorder during adolescence (Kessler, McLaughlin, et al., 2010). As Māori are more likely than non-Māori to be exposed to both socio-economic disadvantage and the childhood adversities listed above, they are more likely to experience the cumulative effect of these risk factors, and their risk of psychopathology during adolescence rises accordingly.

While our findings show that controlling for childhood socio-economic disadvantage and childhood adversity clearly reduced the magnitude of the association between Māori ethnicity and externalising disorders, Māori adolescents were still found to have significantly higher odds of externalising disorders during adolescence than non-Māori (OR 1.5, 95% CI 1.04-2.28, $p<.05$), suggesting that further factors may be contributing to ethnic differences in rates of mental disorder during adolescence. One such factor may be deviant peer affiliation during adolescence.

4.4 Controlling for Ethnic Differences in Deviant Peer Affiliation

Our findings indicate that Māori have significantly higher levels of deviant peer affiliation during adolescence than their non-Māori counterparts (*M* 104.42 *SD* 11.25 Māori vs *M* 99.54 *SD* 9.72 non-Māori, *d* 0.49, $p<.001$). While there is currently no other research available on ethnic differences in deviant peer affiliation in a New Zealand Context, these findings are

comparable to those of Deutsch et al. (2012), and Haggerty et al. (2013) who found higher levels of deviant peer affiliation amongst an ethnic minority population (African-Americans) in comparison to an ethnic majority population (European-Americans).

As deviant peer association is known to be associated with externalising behaviours during adolescence (Barrera et al., 2002), the higher rates of deviant peer affiliation amongst Māori may have contributing to the remaining ethnic differences in rates of externalising disorders during adolescence. This appeared to be the case, as controlling for adolescent deviant peer affiliation resulted in a reduction in the remaining association between Māori ethnicity and externalising disorders during adolescence (OR 1.3, 95% CI 0.88-1.92), reducing this association to statistical non significance (p>.10).

These results indicate that higher levels of adolescent deviant peer affiliation are associated with externalising disorders during adolescence, and are in accordance with previous research that has suggested that those who have higher levels of deviant peer affiliation are more likely to engage in delinquent behaviour (Murray & Farrington, 2010), and have externalising problems such as alcohol abuse (Sher, Grekin, & Williams, 2005), conduct disorder (Murray & Farrington, 2010), and substance use (Van Ryzin, Fosco, & Dishion, 2012).

As mentioned previously, it appears that Māori have higher levels of exposure to known risk factors for adolescent psychopathology from birth and throughout childhood in the forms of socio-economic disadvantage and childhood adversities. Our findings indicate that the higher exposure amongst Māori to these risk factors is indeed contributing to the ethnic disparities seen in adolescent mental health outcomes. As young Māori proceed through their life-course and enter adolescence, our results suggest that they are also more likely than their non-Māori counterparts to have higher levels of deviant peer affiliation. Our findings show that these higher levels of deviant peer affiliation further contribute to the elevated rates of externalising disorders amongst Māori, suggesting that this known risk factor for adolescent maladjustment and psychopathology further influences the life course of young Māori, placing them at risk of maladjustment and mental disorder during adolescence.

Collectively, these findings suggest that many of the risk factors and life processes that place Māori at risk of mental disorders during adolescence seem to be the same as those that place non-Māori at risk of disorder, with a large proportion of the ethnic differences in mental disorders during adolescence appearing to be the result of higher exposure amongst Māori to

childhood socioeconomic disadvantage, childhood adversity and adolescent deviant peer affiliation. These findings are similar to those of international studies, which indicate that childhood adversity, social disadvantage and deviant peer affiliation are risk factors that are common to increased risks of maladjustment and mental disorder in a range of cultural settings (Barrera et al., 2002; Brook et al., 2001; Deković, Wissink, & Meijer, 2004; López & Guarnaccia, 2000; Repetti et al., 2002).

The results of this study suggest that exposure to adversity across multiple risk domains (low childhood SES, childhood adversity and deviant peer association) and developmental periods (infancy, childhood and adolescence) contribute to the risk of teenage mental disorder. These findings are most consistent with the cumulative risk factor model in developmental life-course theory, in which poor adolescent mental health represents the outcome of accumulative exposure to multiple risk factors over the life course (Kuh et al., 2003).

Specifically, the findings of this study indicate that ethnic differences in the rates of internalising disorders during adolescence are largely explained by the higher rates of exposure amongst Māori to childhood socio-economic disadvantage, suggesting that the factors influencing the higher rates of internalising disorders amongst Māori people are socioeconomic rather than cultural in origin. Higher levels of exposure amongst Māori to childhood socio-economic disadvantage also contributed substantially to the ethnic differences in externalising disorders and the prevalence of any mental disorder during adolescence, although not to the same extent as internalising disorders. Similarly, higher levels of exposure amongst Māori to childhood adversity and deviant peer affiliation during adolescence were also found to contribute to the likelihood of maladjustment and mental disorder amongst Māori adolescents.

4.5 Social Policy, Clinical, and Research Implications

The findings of this study suggest relatively high rates of mental disorder amongst New Zealand adolescents. Whether all of those meeting criteria for mental disorder in this study would have disorders of a severity that would warrant professional treatment is difficult to determine, nevertheless, the high prevalence rates do point to the need for mental health services that are well organised and funded, and suitable for adolescent mental health needs. As a disproportionate number of Māori appear to have poor mental health, it is imperative that these services are set out and delivered in ways that are accessible and culturally appropriate for Māori youth (Cunningham, 2011). As Māori are known to experience disparities in accessing and engaging with health care providers (Reid & Robson, 2006), it is

also important that efforts are made to identify and address the issues that contribute to the poorer access to healthcare seen amongst Māori. This requires close inspection and improvement of the "methodology of access" – the philosophy, design, and implementation of strategies around health service accessibility (Cunningham, 2010). Health care systems in New Zealand have historically been dominated by western philosophy, with some Māori consequently finding that mainstream health care and health providers are culturally incongruent with Māori concepts of health (Cunningham, 2010; Jeffery, 2005). This can force Māori to compromise their cultural beliefs, or be placed in culturally unsafe situations in order to access available care. An example of this was provided in a study by Cook, Terryann, and Brunton (2014) whose study aimed to provide recommendations toward optimising the cultural safety and comfort of Māori during women's medical examinations. Cook et al. (2014) outline that clinicians should be careful with bodily fluids to ensure the environment is culturally safe for Māori, making sure that tissues are provided and there are appropriate means of disposal. A Māori participant described a case where this care was overlooked, making her feel at risk:

> "….I had an examination, I would start to bleed and it was tapu for me seeing my blood on the floor where people walk…that really freaked me out 'cause it was on my shoe and I remember telling the doctor, "Can I have something just to wipe my shoe or else I'll be taking my blood out through the waiting room." Blood is a very tapu thing to Maori because it's believed to be the essence of our being" (Cook et al., 2014, p. 26, p.27).

Experiences such as this can also lead Māori delaying or avoiding accessing available health care for fear of finding themselves in culturally unsafe situations (Cunningham, 2010; Wilson, 2008). Although the situation described above is a more general example from the field of health, there are many occasions during engagement, assessment and treatment in which mental health practitioners and mental health services are similarly required to be culturally competent and appropriate to avoid culturally distressing situations for their clients (Durie, 1997a; Newton-Howes, Lacey, & Banks, 2014; Wilson & Baker, 2012). It is therefore crucial that equitably resourced healthcare, including mental health services that align with Māori concepts of health, are available to Māori. This would allow Māori to access mental health care services while maintaining their cultural integrity. In addition to being culturally appropriate, mental health services should aim to ensure that strategies are in place within Māori communities that promote engagement and access to these services based on Māori models of engagement, such as the marae encounters method of engagement outlined by Durie (2007).

This study has also found that socio-economic disadvantage during childhood accounts for a substantial proportion of the ethnic differences seen in mental disorder prevalence during adolescence. A major implication of this finding is that targeted interventions that reduce Māori exposure to socio-economic disadvantage are required to reduce the ethnic inequalities seen in adolescent mental health outcomes, especially in regards to internalising disorders. Similarly, as exposure to childhood adversity has also been identified as a contributor to ethnic differences in mental disorder during adolescence, interventions aimed at reducing childhood adversity, including effective parenting programmes, should also go some way towards reduce ethnic inequalities in adolescent mental health outcomes (Mercy & Saul, 2009), providing that these programmes are accessible and culturally appropriate to Māori so that there is effective engagement, recruitment and continued participation of these whānau (Gifford, Pirikahu, & Families Commission New Zealand, 2009; Herbert, 2001). As mental disorder during adolescence appears to be the result of cumulative risk over the life-course, early intervention is highly recommended as the earlier that intervention takes place, the more likely it is that exposure to these adverse risk factors can be avoided, hopefully placing an individual's life course on a more positive trajectory.

These findings and recommendations indicate that often vulnerable families need intervention across multiple areas. These findings add support to initiatives such as Whānau Ora, a kaupapa Māori provider that aims to unify interventions across the range of available services, using an integrated model of health and social service delivery to provide family wide interventions intended to improve social, economic, cultural and health outcomes for whānau (Boulton, Tamehana, & Brannelly, 2013). In addition to interventions such as Whānau Ora that attempt to reduce the harmful effects of socio-economic disadvantage and childhood adversity, it would also appear advisable to investigate what is contributing to the higher rates of childhood adversity and socio-economic disadvantage experienced by Māori. Research into possible contributing factors such as intergenerational or historical trauma (Koea, 2008; Pihama et al., 2014; Rudegeair, Rickard, & Farrelly, 2006), ethnic inequalities in education (D'Addio, 2007; Maani, 2004) and marginalisation and discrimination (Bécares, Cormack, & Harris, 2013; Robson, Cormack, & Cram, 2007) is necessary to begin to determine how ethnic inequalities in socio-economic disadvantage and childhood adversity may be prevented.

Together with research and targeted intervention aimed at reducing exposure to socio-economic disadvantage and childhood adversity, further research into measures that may prevent deviant peer affiliation in adolescence is also required to identify ways in which

exposure to this risk factor for maladjustment and psychopathology during adolescence may be reduced. Initial findings have implicated both childhood socio-economic disadvantage and childhood adversity as risk factors for deviant peer affiliation (Fergusson & Horwood, 1999), which adds further support to the need for early intervention in these areas.

4.6 Strengths and Limitations

The current study is characterised by a number of methodological strengths. The design features included reliable and valid psychometric instruments, and a longitudinal prospective cohort design which allowed the prospective collection of data on socio-economic, individual and family factors. Despite these obvious strengths there are nevertheless a number of potential limitations to the current study.

Although risk factors that contributed to ethnic differences in mental disorder were able to be identified, it needs to be noted that these findings do not confirm that socio-economic disadvantage during childhood, childhood adversity or deviant peer affiliation have causal effects (especially as ethnic differences in externalising disorders remain). While the statistical models utilised in this study were able to identify key intervening variables, this analysis does not identify the underlying processes by which these variables mitigate the association between Māori ethnicity and mental disorder during adolescence. The risk factors that we identified are highly correlated, with low SES having been associated with childhood adversity (Evans, 2004; Hecht & Hansen, 2001; Sedlak & Broadhurst, 1996), and both childhood socio-economic disadvantage and childhood adversity having been associated with later deviant peer affiliation during adolescence (Fergusson & Horwood, 1999). Because of the correlated nature of these life-course experiences, it is possible that rather than constituting individual risk factors, these variables may be part of a causal chain where low SES during childhood increases the likelihood of experiencing childhood adversity, which in turn increases risk for affiliating with deviant peers during adolescence. It is also possible that there are additional variables, not measured in the current study, that are linked to childhood socio-economic disadvantage, childhood adversity, deviant peer affiliation, and the associated mental disorders. One such example is that the number of childhood adversities used in this study, while adequate, was not exhaustive. As childhood adversities are known to cluster, this increases the risk of confounding variables and suggests that caution should be used in estimating the influence of the exact childhood adversities that were measured. Genetic factors are also possible confounding variables of this type that were not able to be addressed in this analysis.

It should also be acknowledged that while this study attempted to correct some limitations of previous research by gathering data with physical abuse and sexual abuse reports at two different time periods (ages 18 and 21), it still relied on informants' retrospective reports of these types of maltreatment, creating the risk of recall bias. In order to ascertain whether this was a major threat to validity, Fergusson et al. (2011) developed a structural equation model to estimate the contributions of recall bias and test unreliability to reporting variation. Their results indicated that, for this cohort, errors of measurement in reports of childhood abuse did not pose a significant threat to validity. The limitations of recall bias and test unreliability that are associated with retrospective recall should therefore be minimal in this study.

The small sample size of Māori is another limitation of this study. While the overall size of this cohort was adequate, the number of Māori participants in this sample is relatively small. This may have limited the precision of estimation of differences in rates of mental disorder between Māori and non-Māori adolescents, and it may be that community studies that have larger numbers of Māori may yield different estimates of the rates of disorder amongst young Māori. In addition to this, while it may have been valuable to conduct parallel analyses that examined the outcomes of other ethnic groups, the small numbers of participants in the present cohort that belonged to other ethnic minorities meant that we were unable to conduct comparative analyses. For these reasons further studies of other New Zealand samples are required to obtain a better understanding of the nature and extent of Māori and non-Māori differentials in the risk of poor mental health outcomes, as well as how these risks compare to those of other ethnic minorities in New Zealand.

Differences in cultural perceptions of mental disorder may be another limitation of this study. Māori participants in this study may have had alternate cultural perspectives on health and may view the concept of health (including mental health) in a more holistic manner (Durie, 1985, 2001). Māori models of health that describe Māori views and concepts of health generally constitute a broader view of what contributes towards good or poor health (including spiritual, social and emotional aspects of health as well as physical health) (Durie, 1985; Love & Pere, 2004; Pere & Nicholson, 1997; Pitama et al., 2007; Rochford, 2004). Māori models of health also consider these aspects of health to be inter-connected rather than being compartmentalised (Durie, 1985; Pere & Nicholson, 1997). As a consequence of this inter-connection, each aspect of health is seen as having the potential to impact on other areas of health, as well as an individual's overall health (Durie, 1985; Pere & Nicholson, 1997). This different cultural understanding of health and mental health amongst Māori, and the lack of culturally appropriate measures and frameworks used in this study may mean that these

findings misrepresent mental health outcomes amongst Māori adolescents. It is therefore proposed that in future studies that aim to assess mental health outcomes amongst Māori, culturally appropriate practice and criteria should be should be used in conjunction with standardised diagnostic criteria to allow for both the culturally appropriate assessment of mental health outcomes, and the cross-cultural comparisons necessary to examine ethnic differences in mental health outcomes.

Finally, the data for this study were gathered from a cohort that was studied during a specific historical period and born in a specific region of New Zealand. Because of this it is unclear whether the conclusions drawn in this study are applicable to other populations.

4.7 Conclusions

In this paper, CHDS data gathered over 18 years were used to investigate possible contributing factors to ethnic differences in the prevalence of mental disorder during adolescence. The findings of this study validate previous research that suggests there are higher rates of mental disorder amongst Māori than their non-Māori counterparts, with results of the present study suggesting that the higher rates of mental disorders amongst young Māori (ages 15-18) in this cohort were influenced by at least three sets of processes. First, a proportion of the elevated rates of mental disorder amongst young Māori were accounted for by the fact that members of this group tended to come from socio-economically disadvantaged backgrounds. Second, the higher rates of childhood adversity experienced by Māori further mediated the association between ethnicity and mental disorder during adolescence. Finally, ethnic differences in deviant peer affiliation were also found to be a contributing factor to the higher odds of externalising disorders amongst Māori adolescence.

Within the limitations discussed previously, these results suggest that the higher rates of mental disorder amongst Māori adolescents reflect a life course process in which adverse socio-economic, childhood adversity, and peer factors combine to increase individual susceptibility to mental disorder during adolescence. While further investigation is needed into what factors may be contributing to the risk factors identified in this study (including childhood socio-economic disadvantage, childhood adversity and deviant peer affiliation), the fact that this study was able to identify these risk factors that appear to account for a substantial component of the ethnic inequalities in adolescent psychopathology (especially in regards to internalising disorders) has added to the ongoing understanding of the development of adolescent maladjustment and mental disorders.

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